FINAL

FIVE-YEAR REVIEW

UMETCO MINERALS CORPORATION
URAVAN SUPERFUND SITE

URAVAN, COLORADO

March 13, 2000

RAC Contract No. 68-W7-0039

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Prepared for:

U.S. Environmental Protection Agency, Region VIII

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EXECUTIVE SUMMARY

Morrison Knudsen Corporation (MK) was tasked by the United States Environmental Protection Agency (EPA) Region VIII to conduct a Five-Year Review of the Umetco Minerals Corporation Uravan Superfund Site to evaluate whether the remedial actions taken at the site to date remain protective of human health and the environment. The purpose of this review is to confirm that the selected remedies remain effective. This is accomplished through a site visit, review of the administrative records, and review of applicable or relevant and appropriate requirements (ARARs).

The Uravan site was contaminated by radioactive residues resulting from the processing of vanadium- and uranium-containing ores from the early 1900s through the mid-1980s. In December 1983, the State of Colorado filed a natural resources damages claim against Union Carbide and Carbon Corporation and Umetco under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA). The site was proposed to the National Priorities List (NPL) in 1984 and was finalized to the NPL in 1986. In 1985, Umetco and the State of Colorado began discussions concerning remedial action and cleanup of the site. The results of these discussions was the preparation of a Consent Decree and Remedial Action Plan (RAP) in 1986 that outlined the requirements for Umetco to remediate the site. The United States District Court for the State of Colorado approved the Consent Decree and RAP in 1987.

Remedial actions conducted to date include:

- Removal and cleanup of dispersed materials and contaminated soils from approximately 340 acres
- Relocating more than 1.8 million cubic yards of mill wastes and contaminated materials to secure repositories on Club Mesa
- Constructing covers for the secure repositories with more than 1.7 million cubic yards of earthen materials
- Constructing five double-lined ponds totaling 40 acres for the evaporation of hillside seepage, tailings pile seepage and extracted ground water
- Demolition and removal to the Uravan tailings pile of approximately 50 major mill facility structures and buildings, including the process circuits, and removal of more than 260 buildings in the town of Uravan
- Collection of more than 38 million gallons of hillside and tailings pile seepage containing approximately 3,000 tons of inorganic compound contamination. Seepage was placed into the Club Ranch Evaporation Ponds for evaporation

- Extraction of approximately 157 million gallons of contaminated ground water with removal of approximately 10,000 tons of inorganic compound contamination. Contaminated ground water was placed into the Club Ranch Evaporation Ponds for evaporation
- Removing contaminated materials from both the Old and New Town Dumps. Materials were placed into the Club Mesa Tailing Piles.

Review of Annual Environmental Monitoring Data Reports from 1994, 1995, 1996, 1997, and 1998 indicate the following:

- Ambient air particulate concentrations of radionuclides at Uravan has generally decreased over the past five years
- Total suspended particulate (TSP) concentrations exceeded permit values several times in the last five years. The majority of the exceedences reportedly occurred when a subcontractor to the Department of Energy (over which Umetco had no control) was placing Uranium Mill Tailings Remedial Act (UMTRA) materials in the Burbank Repository. Otherwise, TSP concentrations were generally within acceptable levels
- Concentrations of radionuclides, metals, or other inorganic contaminants in the San Miguel River at Uravan have not changed over the past five years and appear to be equivalent at all six sampling sites throughout the Uravan site, although this has not been tested statistically by Umetco
- Concentrations of total dissolved solids in the Kayenta formation beneath the Club Ranch Evaporation Ponds has decreased an average 73 percent in the higher permeability zones and 37 percent in lower permeability zones in the last eight years of ground water extraction
- Ionizing radiation doses to site workers over the last five years were less than six percent of the allowable dose for radiation workers set by the Nuclear Regulatory Commission (NRC) and the State of Colorado
- Environmental ionizing radiation doses to the nearest resident in the last five years were less than the public dose limits set by the NRC and the State of Colorado.

Environmental conditions identified during this Five-Year Review that remain to be addressed or completed included:

1. A small seep was recently discovered along the west wall of Tailings Pile #1-2 abutting the adjoining mesa. The source(s) of this seep is currently not known. Based upon visual observations of the seep area, it does not appear that the tailings pile has been negatively impacted by this seep.

It does raise concerns, however, of the potential presence of additional seeps in this tailing pile that could eventually negatively impact the tailings pile. It is recommended that investigations into the cause(s) and source(s) of this seep be immediately undertaken, determine whether the structural integrity of Tailings Pile #1-2 may be impacted, and what mitigation measures can be conducted to minimize future infiltration into the tailings pile.

2. A joint separation, e.g., a separation between the tailings material and the back wall of the tailings pile, was discovered in Tailings Pile #3 in 1993. Investigations into the cause of the separation have been conducted over the last six years, but the remedial action alternative submitted to the State for approval has not been implemented. The joint separation should be repaired by the end of calendar year 2000 so that it can be monitored prior to total closure of Tailings Pile #3 by the end of December 2002.

3. Plans for completing the remediation of the hillside beneath the former B-Plant, where the concrete foundations and appurtenant concrete structures associated with the former Vanadium Plant were removed, have not been submitted by Umetco to the State for review and approval. As any remedial activity of this site may be subject to a risk based cleanup determination, it is essential that plans be submitted and approved by the State of Colorado as soon as possible so that remediation of this area is completed before the end of December 2002.

In summary, remedial activities at the Umetco Minerals Corporation Uravan Remedial Action Project are being conducted in general accordance with the Consent Decree and the RAP and are scheduled for completion by the end of December, 2002. Based on available information, it appears that selected remedies remain effective in protecting the health of the public and environment.

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LIST OF ACRONYMS

ARARs	Applicable or Relevant and Appropriate Requirements
BGS	Below Ground Surface
CDPHE	Colorado Department of Public Health and the Environment
CCR	Code of Colorado Regulations
CFR	Code of Federal Regulations
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
cm^2	Square Centimeter
DOE	United States Department of Energy
DPM	Disintegrations per Minute
EPA	United States Environmental Protection Agency
HDPE	High Density Polyethylene
MK	Morrison Knudsen Corporation
mREM	Millirem
Fg/L	Microgram per Liter
Fg/m^3	Microgram per Cubic Meter
MSDS	Material Safety Data Sheet
NCP	National Contingency Plan
NRI	National Radium Institute
NPL	National Priorities List
NRC	Nuclear Regulatory Commission
OSWER	Office of Solid Waste and Emergency Response
RAC	Response Action Contract
RAP	Remedial Action Plan
RI/FS	Remedial Investigation/Feasibility Study
RSO	Radiation Safety Officer
SARA	Superfund Amendments and Reauthorization Act
SHPO	State Historic Preservation Officer
TDS	Total Dissolved Solids
TEDE	Total Effective Dose Equivalent
THPO	Tribal Historic Preservation Officer
TSP	Total Suspended Particulates
UCC	Union Carbide and Carbon Corporation
UMTRA	Uranium Mill Tailings Remedial Act
WD	Withdrawal Well

1.0 INTRODUCTION

Morrison Knudsen Corporation (MK) was tasked by the United States Environmental Protection Agency (EPA) Region VIII to conduct a Five-Year Review of the Umetco Minerals Corporation Uravan Superfund Site to evaluate whether the response actions taken at the site to-date remain protective of human health and the environment. The purpose of this review is to confirm that the selected remedies remain effective. The review was conducted under EPA Response Action Contract (RAC) No. 68-W7-0039, Work Assignment Number 005-FRFE-BE-0836.

This Five-Year Review was conducted according to procedures outlined in Office of Solid Waste and Emergency Response (OSWER) Directive 9355.7-02, Structure and Components of Five-Year Reviews; OSWER Directive 9355.7-02A, Supplemental Five-Year Review Guidance; and OSWER Directive 9355.7-03A, Second Supplemental Five-Year Review Guidance, and is consistent with the provisions of the Superfund Amendments and Reauthorization Act of 1986 (SARA), the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (42 USC 9601, et. seq.), and the National Contingency Plan (NCP).

2.0 SITE BACKGROUND

The site is located in the western portion of Montrose County on Highway 141 approximately 13 miles northwest of the Town of Nucla and 81 miles south of the Town of Whitewater in Mesa County (Figure 2-1). The town of Uravan was demolished during remedial activities at the site and, except for a couple of historical buildings, no longer exists. The City of Montrose is 115 miles southeast of Uravan, and Grand Junction is located 90 miles to the northeast. The site is located on the bank of the San Miguel River which drains into the Colorado River. Figures 2-2 and 2-3 show the layout of the Uravan Site as of 1999.

Mining operations in this area of Colorado began in the early 1900s. Mining of radium-bearing carnotite ore ($K_2(UO_2)(VO_4)_2$) began in approximately 1910 when Standard Chemical Company first acquired mining claims in the area. The Standard Chemical Company built a radium recovery mill known as the Joe Junior Mill in 1914. The mill was located on the valley floor along the San Miguel River at the site of what later became known as " A-Plant".

In 1929, the U.S. Vanadium Corporation, a subsidiary of Union Carbide and Carbon Corporation (UCC) purchased the Standard Chemical Company's claims in the area. U.S. Vanadium Corporation expanded

the A-Plant in 1934, constructing a mill and roasting plant to recover vanadium from the carnotite ore. The town of Uravan was established in 1935 to house workers and their families at the mill and mine facilities. In 1937 and 1938, the mill reportedly was also extracting uranium from the ore through uranium recovery circuits. During this operation, approximately 250,000 pounds of triuranium octoxide (U_3O_8) was produced in the form of green sludge. This sludge was refined in Uravan and vanadium and uranium concentrates were produced.

The Uravan mill's capacity was expanded in the early 1940s and 1950s to meet the demand for uranium required by the United States government's weapons programs. The mill circuits were continually improved to meet product demand and the " B-Plant" was constructed in 1955. The B-Plant was located on a bench on Club Mesa several hundred feet above the San Miguel River. Uranium was recovered from the leach liquors with a column ion-exchange process, followed by precipitation and drying of the yellow cake. Tailings from B-Plant were placed in piles on a bench of Club Mesa. A radium removal circuit was installed in 1958 to treat waste solutions. Three unlined Club Ranch Ponds were constructed between 1963 and 1965 to aid liquid disposal through a combination of evaporation and seepage. Additional liquid waste disposal improvements added later included the addition of a neutralization circuit to permit part of the wastes to be discharged to the San Miguel River and the installation of a spray evaporation system in 1976 on Club Mesa. Between 1936 and 1984, when Union Carbide and Carbon Corporation operated the mill complex, approximately 42 million pounds of uranium and 222 million pounds of vanadium were produced. Umetco Minerals Corporation (Umetco), a subsidiary of Union Carbide, has operated the facility since its closure in 1984.

The State of Colorado (State) filed a natural resources damages claim against Union Carbide and Carbon Corporation and Umetco in December, 1983 under CERCLA. The Uravan site was proposed to the National Priorities List (NPL) on October 15, 1984, and was finalized on the NPL on June 10, 1986.

In 1985, the State and Umetco began discussions regarding remedial activities to be conducted at the Uravan site. In 1987, these discussions resulted in the preparation of a Consent Decree and associated Remedial Action Plan (RAP). The RAP is the functional equivalent of an EPA Record of Decision (ROD) and Remedial Investigation/Feasibility Study (RI/FS). The United States District Court for the District of Colorado approved the Consent Decree and RAP on February 12, 1987.

Under this agreement, Umetco is required to complete the following general remedial activities specified in the RAP:

- Reshaping the 10 million cubic yard tailings repositories and constructing a long-term containment cover and appropriate drainage controls

- Relocating 1.5 million cubic yards of mill wastes, including evaporative crystals and wastewater treatment sludges, to a secure on-site repository and constructing long-term containment controls

- Cleanup of dispersed soils

- Decommissioning and demolition of the milling facilities

- Remediation of ground water resources.

Photo 2-1 is an areal photograph of the Uravan Superfund site in of July 1989. Photo 2-2 shows the site as of August 1997.

3.0 REGULATORY COMPLIANCE

Consistent with Section 121 of CERCLA, as amended, and Section 300.430 (f) of the NCP, the EPA is performing the Five-Year Review for the Umetco Minerals Corporation Uravan Superfund Site. EPA determined the level of review based on site-specific considerations including the nature of the response action, the status of the onsite response activities, proximity to populated areas and sensitive environments, and the interval since the last review was conducted. In most cases, EPA performs a Level I analysis for the Five-Year Review. Level I is the lowest level of evaluation of protectiveness. Based on the guidance documents, a Level I Five-Year Review was performed of the Umetco Minerals Corporation Uravan Superfund Site. The components of a Level I Five-Year Review, as suggested by EPA guidance (EPA, 1991; EPA, 1994a, EPA 1995a), include:

- Review of documented operation and maintenance of the site

- Performance of a limited site visit

- Limited analysis of site conditions

- Review of the administrative record

- Review of Federal and State environmental laws cited in the RODs (i.e., Consent Decree and RAP) to determine if they remain applicable or relevant and appropriate requirements (ARARs).

3.1 Statutory Review

A statutory five-year review is required at any site where unlimited use and unrestricted exposure, based on ROD (i.e., federal equivalent of Colorado's Consent Decree and RAP) cleanup levels, have not been attained. A Five-Year Review is required no less than every five years after initiation of the selected remedial action. In 1994, EPA issued a 1993 Five-Year Review for the Umetco Minerals Corporation Uravan Superfund Site for the period 1988 through December 1993 and completed the current review in October 1999. Another Five-Year Review will be conducted in 2004 or earlier unless existing onsite contamination is removed to allow unrestricted access and unlimited use of the property. This document presents the results of the 1999 review.

3.2 ARARs

The Consent Decree for Civil Action No. 83-C-2384 for the State v. UCC and Umetco and the RAP were reviewed for this Level I Five-Year Review. Applicable or Relevant and Appropriate Requirements (ARARs) discussed in these documents are presented below. The current status of each ARAR is noted. The most recent version of Colorado and Federal regulatory codes as available through the Internet were consulted for changes to Applicable or Relevant and Appropriate Requirements (ARAR) standards. Table 3.2-1 presents the ARARs as invoked in the Consent Decree and RAP, and the current status of those standards. Based on this review, the Uravan Site meets current ARARs.

As stated in the Five-Year Review conducted in 1997, some changes were made to the Colorado Rules and Regulations Pertaining to Radiation Control, 1990 as amended in Part 4. These standards apply to public dose limits. Additionally 10 Code of Federal Regulations (CFR) Part 20 became effective in Colorado in January 1994, which also specifies public dose limits due to airborne radioactive effluents to the environment. Since 1997 there have been no changes to the ARARs for the Uravan Site.

Table 3.2-1
ARARs Status

Regulatory Source	Standard	Status
40 CFR§192, Subpart D	Soil Criteria: 5 pCi/g Ra^{226} above background in soil 0 - 15 cm BGS 15 pCi/g Ra^{226} above background in soil > 15 cm BGS, averaged in 15 cm thick layers (Table 4.1.2-1 RAP)	No change.
40 CFR§192.32(a)(2)	Ground Water Quality Protection Standards (Table 5.4.3.2-2 RAP)	No change.
10 CFR 20	Occupational air exposure	No change.
6 C.C.R. 1007 -1 Part 4	Radiation Protection Program	No change.
6 C.C.R. 1007 -1 Part 18, Criterion 8	Airborne Effluent ALARA	No change.
6 C.C.R. 1007 -1 Part 17	Transportation of Radioactive Materials	No change.

1. CFR: Code of Federal Regulations
2. CCR: Code of Colorado Regulations

4.0 DESCRIPTIONS OF REMEDIAL ACTIONS AT SPECIFIED AREAS

4.1 Atkinson Creek Crystal Disposal Area

4.1.1 History

The Atkinson Creek Crystal Disposal Area, Figure 2-3, was located downstream from the Club Ranch Ponds and adjacent to Atkinson Creek. This disposal area was constructed in the early 1970s on the site of a former mobile home park. The mobile homes were removed and the underlying soils were excavated and stockpiled adjacent to the area. After preparation of the site, approximately 200,000 cubic yards of raffinate crystals from Club Ranch Ponds #1 and #6 were removed and stored in the area. No liner was placed beneath the crystals to prevent contamination of the underlying soils or ground water. Natural soils were then placed on the raffinate crystals to form a soil cover approximately twelve inches thick.

4.1.2 Remedial Objectives

In the RAP, the State selected excavation and on-site disposal of raffinate crystals in the Burbank Quarry, an approved raffinate crystal storage area, and disposal of other contaminated solids in the Tailings Piles on Club Mesa as the remedy for the Atkinson Creek Disposal Area. The objectives of this remedy were to remove the source of potential future ground and surface water contamination by raffinate crystal dissolution or erosion.

4.1.3 Site Status and RAP Requirements

4.1.3.1 Status December 1993 (Excerpted from EPA 1993 Five Year Review, Umetco 1997 Five Year Review, Colorado Department of Public Health and Environment (CDPHE) 1999 Uravan Remedial Action Plan Status Report)

Initial removal of the crystals started in the spring of 1991 and continued until mid-summer of 1991. Radiation and soil sampling surveys were conducted in late 1991. Soil concentrations of arsenic, molybdenum, thorium-230, and vanadium were found to exceed the "No Further Action" criterion for soils in a small percentage of the area. Umetco evaluated the health risk of the residual contaminants using three different exposure scenarios. The Colorado Department of Public Health and the Environment evaluated the risk assessment and found there was not significant health risk to the public posed by the residual

contaminants so long as the area was covered by one foot of clean soil. The RAP called for initial removal of crystals to be completed by December 31, 1992. Umetco requested a RAP modification to this date since the results of the risk assessment were still outstanding. Final reclamation was completed as required by the new date of December 31, 1993.

4.1.3.2 Status October 1999 (Excerpted from Umetco 1997 Five Year Review, 1999 CDPHE Uravan Remedial Action Plan Status Report)

No further activity was undertaken at this site since the last Five-Year Review was prepared. Umetco is currently conducting performance monitoring of this site as required by the RAP. Although required by the RAP, a Final Construction Report has not yet been submitted to the State.

Remedial action at this site is 100 percent complete as of October 14, 1999

Table 4.1.3-1 summarizes the major requirements for remedial activities at the Atkinson Creek Disposal Area specified in Section 4.1.2 of the RAP, required completion dates as specified in Section 4.1.4 of the RAP, and status as of October 14, 1999.

4.1.4 Summary of Site Visit Observations and Findings

The on-site visits of October 13 and 14, 1999 found the Atkinson Creek Disposal Area to be visually restored as compared to the surrounding areas not included in the Atkinson Creek Disposal Area. Crystals, discoloration, or other overt signs of contamination were not observed in this area. Visible signs of severe erosion were also not observed. Vegetation had re-established itself and visually appeared to be very healthy.

4.1.5 Photographs

Photos 4.1-1 and 4.1.2 illustrate the current status of the Atkinson Creek Disposal Area, showing re-establishment of healthy-looking vegetation.

Recommendations:

1. A Final Construction Report for the Atkinson Creek Disposal Area should be submitted to the State as soon as possible.

Table 4.1.3-1 Atkinson Creek Disposal Area		
RAP Requirements	**Required Date of Completion**	**Site Status 10/14/99** ***Remedial Actions At This Site Complete as of 10/14/99***
1. Raffinate crystals and cover soils shall be excavated and removed from the Atkinson Creek Disposal Area. These materials shall be placed, compacted, and disposed in the secure crystal repository, the Burbank Quarry in accordance with the Approved Final Plans and Specifications.	12/31/92 Note: RAP modified so that completion date was 12/31/93	***Completed as required by 12/31/93*** Approximately 200,000 cubic yards of raffinate crystals and cover soils were excavated and removed from the Atkinson Creek Disposal Area and placed in the Lower Burbank Repository.
2. After crystal removal, peripheral contaminated soils and the contaminated soils beneath the crystals shall be excavated, placed, compacted, and disposed on the tops of the Tailings Piles on Club Mesa in accordance with the Approved Final Plans and Specifications.	12/31/92 Note: RAP modified so that completion date was 12/31/93	***Completed as required by 12/31/93*** All contaminated soils were excavated, placed, compacted and disposed on top of Tailings Pile #1-2.
3. Completion of contaminated soil removal shall be based upon specified criteria. If sandstone or siltstone bedrock or the water is encountered, soil sampling is not required.	12/31/92 Note: RAP modified so that completion date was 12/31/93	***Completed as required by 12/31/93*** Risk assessment for arsenic, molybdenum, thorium-230, and vanadium concentrations above cleanup levels specified in RAP indicated no significant health risks posed by materials remaining beneath one foot of soil. Agreed to by State.

Table 4.1.3-1 Atkinson Creek Disposal Area		
RAP Requirements	**Required Date of Completion**	**Site Status 10/14/99** ***Remedial Actions At This Site Complete as of 10/14/99***
4. During remedial activities, runoff controls shall be in place to prevent releases of hazardous materials.	12/31/92 Note: RAP modified so that completion date was 12/31/93	Not discussed in documents reviewed during this Five-Year Review
5. Atkinson Creek Disposal Area shall be graded to contours that provide a stable ground surface configuration consistent with long-term stability and erosion resistance of the area.	12/31/92 Note: RAP modified so that completion date was 12/31/93	***Completed as required by 12/31/93*** Area was graded to match surrounding contours.
6. Graded area shall be covered with at least one foot of random fill and revegetated.	12/31/92 Note: RAP modified so that completion date was 12/31/93	***Completed as required by 12/31/93*** The Atkinson Creek Area was covered with a minimum of one foot of random fill and revegetated.

Table 4.1.3-1 Atkinson Creek Disposal Area		
RAP Requirements	**Required Date of Completion**	**Site Status 10/14/99** ***Remedial Actions At This Site Complete as of 10/14/99***
7. If monitoring of the cover and vegetation performance, after completion of remedial activities but prior to closure of the Uravan Facility demonstrates that performance requirements as stated in the Quality Plan have not been met, Umetco shall implement additional State-approved remedial activities to achieve required performance.	As required	***Has not been required to-date by the State.***
8. Restoration of the underlying aquifer shall be in accordance with Section 5.0 of the RAP.	Not specified in the RAP	***Has not been required to-date by the State.***
9. A Final Construction Report shall be submitted to the State.	Not later than ninety (90) days after the completion of initial vegetation.	***NOT COMPLETED AS REQUIRED BY RAP*** A Final Construction Report was prepared but was not submitted to the State.
10. A Certification Report shall be submitted to the State.	Not later than 120 days after completion of all remediation activities at the Uravan site	***Not required as of 10/14/99*** All remediation activities at the Uravan site have not been completed.

Table 4.1.3-1 Atkinson Creek Disposal Area		
RAP Requirements	**Required Date of Completion**	**Site Status 10/14/99** ***Remedial Actions At This Site Complete as of 10/14/99***
11. Long-term monitoring and maintenance of the surface configuration and vegetation after closure of the Uravan Facility shall be conducted pursuant to the Colorado Radioactive Materials License.	After closure of Uravan facility	***Ongoing*** Monitoring and maintenance requirements specified in the Radioactive Materials License.

4.2 Club Ranch Ponds Area

4.2.1 History

The Club Ranch Ponds Area consisted of six unlined liquid waste disposal ponds located down valley from the Uravan Mill site and ancillary disposal areas, as shown in Figures 2-2, 2-3, and 4-1. The Club Ranch Evaporation Ponds were constructed in the early 1960s to serve as both evaporative and seepage discharge ponds. The ponds were excavated into gravely terrace deposits of the San Miguel River. The depths of the ponds ranged from approximately eight feet to almost thirty feet. Umetco estimated that the ponds contained approximately 560,000 cubic yards of raffinate crystals and 30 million gallons of liquid.

Contaminants were identified in the alluvial gravels and underlying Kayenta Formation. It was thought that the majority of the radionuclide contaminants were trapped in the material directly beneath the ponds. There was also evidence of seepage into the San Miguel River along the pond. in the form of crystals, as shown in Photo 4.2-6 taken in June 1987.

4.2.2 Remedial Objectives

In the RAP, the State selected excavation and on-site disposal of raffinate crystals in the Burbank Quarry, an approved raffinate crystal storage area, and disposal of other contaminated solids in the Tailings Piles on Club Mesa as the remedy for the Club Ranch Evaporation Ponds Area. The objectives of this remedy were to remove the source of potential future contamination of the Kayenta-Wingate aquifer and the San Miguel River.

4.2.3 Site Status and RAP Requirements

4.2.3.1 Status December 1993 (Excerpted from EPA 1993 Five Year Review, Umetco 1997 Five Year Review, CDPHE 1999 Uravan Remedial Action Plan Status Report)

New evaporation ponds, called the Club Ranch Evaporation Ponds # 7 and #8, were constructed in the fall of 1987 and spring of 1988 in order to contain hillside seepage liquids and to contain liquids transferred from the old, unlined Club Ranch Evaporation Ponds. These ponds were constructed in conformance with state and federal requirements in order to preclude discharge of mill related liquids. The liquids remaining

in the unlined Club Ranch Evaporation Ponds were transferred into Club Ranch Evaporation Ponds #7 and #8 in 1988.

Initial removal of the crystals in the unlined Club Ranch Evaporation Ponds commenced during the fall of 1989. Approximately 550,000 cubic yards of deposits were removed by mid-1991. The RAP also called for reconstruction of all ponds by December 31, 1991. Umetco requested and was granted a modification to this date in order to perform phased reconstruction of the ponds. Phased reconstruction would permit the ponds to be built on an as-needed basis. Three lined ponds, Club Ranch Evaporation Ponds #1, # 4, and #6 were reconstructed during late 1991 and 1992.

Reconstruction of all ponds was 80 percent complete as of December 1993.

During initial crystal removal and pond reconstruction, contaminated ground water was encountered in the alluvial materials on top of the bedrock beneath the unlined Club Ranch Evaporation Ponds. This ground water was intercepted and placed in Club Ranch Evaporation Ponds #7 and #8. Final reclamation of this area will be undertaken after completion of the valley ground water cleanup.

4.2.3.2 Status October 1999 (Excerpted from Umetco 1997 Five Year Review, CDPHE 1999 Uravan Remedial Action Plan Status Report)

Reconstruction of lined Club Ranch Evaporation Ponds #1, #4, and #6 is 100 percent complete as of October 14, 1999.

In 1997, 20 exploration trenches were excavated through the shallow alluvium material in the lower unlined Club Ranch Evaporation Ponds #2, #3, and #5. Liquid believed to be either contaminated perched ground water or residual seepage from the ponds was collected in these trenches and pumped into the lined Club Ranch Ponds for evaporation. Approximately 1.6 million gallons of perched ground water was transferred from the trenches in the unlined ponds to the lined ponds by the end of the third quarter 1999.

Removal of additional contaminated soils and other materials from the area of the lower unlined Club Ranch Evaporation Ponds # 2, #3, and #5, was performed in 1998. Excavation continued until the underlying bedrock was encountered. This action removed the final significant source of contamination from the Club Ranch Evaporation Ponds Area. Dikes around these ponds were permitted to remain in place to collect precipitation that is collected in dewatering points, e.g., trenches in the shallow alluvium, and immediately

transferred to the lined Club Ranch Evaporation Ponds. Final removal of all contaminated soils will be undertaken during the phased removal of the lined Club Ranch Evaporation Ponds that will commence following completion of the ground water remediation program in approximately 2003.

The synthetic liner of Pond #8 was replaced in 1994. Minor maintenance to the liners of the lined Club Ranch Evaporation Ponds were undertaken during the period of 1993 through 1999. The purpose of this maintenance was to repair minor tears or holes in the liners. New probes and alarm system were also installed in Club Ranch Evaporation Pond #7 in 1998.

In 1999, the site installed a manually operated enhanced evaporation pilot system in Club Ranch Pond #8 to determine whether water pumped through spray heads would result in a significant increase in water evaporation. This pilot system consists of eight double-head sprays, although the State currently permits the use of only four of the double-head sprays. According to Umetco site personnel, operation of the system has resulted in an increased evaporation rate from 1 gallon/minute/acre to approximately 2 gallons/minute/acre. Club Ranch Pond #8 is approximately 7 acres in size, so approximately 14 gallons of water are evaporated from this pond every minute. Umetco expects to request the State in calendar year 2000 to permit the use of the additional heads in the pilot program, and possibly expand the system's use to the other ponds. If this system proves effective, the amount of time required to evaporate the Club Ranch Evaporation Ponds' liquids at the end of site remediation and shutdown of the ground water remediation program may be significantly reduced.

Table 4.2.3-1 summarizes the major requirements for remedial activities at the Club Ranch Evaporation Ponds Area specified in Section 4.2.2 of the RAP, required completion dates as specified in Section 4.2.4 of the RAP, and status as of October 14, 1999.

4.2.4 Summary of Site Visit Observations and Findings

During the site visit on October 13 and 14, 1999, the five lined Club Ranch Evaporation Ponds, #1, #4, #6, #7, and #8, visually appeared to be in good condition and no visible defects in the liners were evident. According to site personnel, none of the ponds had ever experienced a contaminant effluent rate exceeding the permissible value of 5 gallons per minute that would require activation of the Liner Failure Contingency Plan. In addition, site personnel reported that none of the lined Club Ranch Evaporation Ponds had ever overflowed or otherwise released water to the San Miguel River.

Ground water pumped into the lined Club Ranch Evaporation Ponds has resulted in small amounts of raffinate crystal growth on the liners, especially on Club Ranch Evaporation Ponds #1,# 4, and #6. A white-looking material, visually similar to raffinate crystals, was observed along the east side of the San Miguel River directly below the old unlined Club Ranch Evaporation Ponds. This material is in the same area on the San Miguel River as the raffinate crystals shown in Photo 4.2-6 which was taken in June 1987.

The enhanced evaporation system was observed in Club Ranch Evaporation Pond #8. Four of the eight double-spray heads were in operation throughout the visit.

4.2.5 Photographs

Photos 4.2-1 and 4.2-2 illustrate the unlined Club Ranch Evaporation Ponds as they existed in May 1989. Large volumes of raffinate crystals are observed in these photographs. Photo 4.2-3 illustrates the status of the Club Ranch Evaporation Ponds as of October 1999. Photo 4.2-4 shows the enhanced evaporation pilot system consisting of eight double spray heads, with four of the double spray-heads in operation. Small volumes of crystals forming in the new lined Club Ranch Evaporation Ponds can be seen in Photo 4.2-5.

Recommendations:

1. Additional studies should be undertaken of the banks of the San Miguel River where raffinate crystals appear to still be located. The studies should confirm that this material either is or is not comprised of raffinate crystals or crystal residue. If the material is found to be of raffinate crystal origin, an assessment should be initiated to determine the potential risk of leaving these materials in place until the final reclamation of this area is undertaken.

Table 4.2.3-1 Club Ranch Ponds Area		
RAP Requirements	**Required Date of Completion**	**Site Status 10/14/99**
1. All liquids shall be evaporated in place.	12/31/88	***Completed - Liquids transferred to Ponds 7 & 8 by 12/31/.***88
Raffinate crystals removed in order to construct evaporation ponds for hillside seepage, toe berm seepage and tailings liquid may be temporarily stored on Club Mesa, existing unlined Club Ranch Ponds, or in another disposal area approved by the State.	12/31/91	***Completed by 12/31/91.***
These materials shall be removed and finally disposed in the secure crystal repository, the Burbank Quarry.	12/31/91	***Completed by 12/31/91.***
2. After removal of the raffinate crystals, contaminated soils surrounding the Club Ranch Ponds and the contaminated soils beneath the crystals shall be excavated, placed, compacted, and disposed on the tops of the Tailings Piles on Club Mesa in accordance with the Approved Final Plans and Specifications.	12/31/91	***Completed by 12/31/91.*** All contaminated soils were excavated and placed on top of Tailings Pile #1-2 and compacted.
3. After excavation of contaminated soils, scintillometer surveys and soil assays for radionuclides and heavy metals to ascertain residual contamination levels shall be conducted.	12/31/91	***Completed by 12/31/91.***

Table 4.2.3-1 Club Ranch Ponds Area		
RAP Requirements	**Required Date of Completion**	**Site Status 10/14/99**
4. Uncontaminated materials remaining in the pond dikes may be used to grade the site after removal of raffinate crystals and contaminated soils.	12/31/91 Permit modified to permit completion by 12/31/92	***Completed by 12/31/92.***
5. Any area not used as a site for the evaporation of liquids shall be reclaimed in accordance with specified procedures.	Not specified in RAP	***Completed.*** The area was graded to match surrounding contours.
6. Evaporation pond areas shall be reclaimed immediately upon closure of the evaporation ponds in accordance with the specified manner.	Upon closure of Ponds	***Not Completed.*** The area will be reclaimed upon completion of the ground water extraction program and closure of the Ponds.
7. Reclamation of any part of the Club Ranch Ponds Area shall be governed by specified procedures.	Not specified in RAP	***Not Completed.*** The area will be reclaimed upon completion of the ground water extraction program and closure of the Ponds.

Table 4.2.3-1 Club Ranch Ponds Area		
RAP Requirements	**Required Date of Completion**	**Site Status 10/14/99**
8. If monitoring of the cover and vegetation performance, after completion of remedial activities but prior to closure of the Uravan Facility demonstrates that performance requirements as stated in the Quality Plan have not been met, Umetco shall implement additional State-approved remedial activities to achieve required performance.	As required	***Not Required as of 10/14/99.*** Final reclamation of this area will be not be completed until the five lined Club Ranch Area Ponds and all underlying contaminated soils are removed and placed into the B-Plant Repository. This will not occur until ground water extraction activities stop in approximately 2003.
9. New evaporation ponds shall be designed, constructed, and installed in accordance with 40 CFR 192.32(a)(1) to prevent the migration of any hazardous constituents into adjacent subsurface soil, ground water, or surface water during their operational life. Each pond shall have a synthetic liner placed upon a clay foundation or base. The pond freeboard, dike, and capacity design shall be based upon the greatest amount of annual rainfall expected for one year out of 25 and the annual evaporation rate used shall be the annual rate expected for nine years out of ten. The design shall include a seepage/leak detection system. A ground water monitoring program shall be designed and initiated, and shall include action levels for response.	12/31/91 Note: RAP modified to permit completion by 12/31/92	***Construction of Ponds #7 and #8 completed by 12/3188, Ponds #1, #4, #6 completed by 12/31/92.*** ***Initial monitoring of ground water wells began in 1991 and 1992.***

Table 4.2.3-1 Club Ranch Ponds Area		
RAP Requirements	**Required Date of Completion**	**Site Status 10/14/99**
10. Restoration of the underlying aquifer shall be in accordance with Section 5.0 of the RAP.	Not specified in the RAP	***Ongoing as of 10/14/99.***
11. A Final Construction Report shall be submitted to the State.	Not later than ninety (90) days after the completion of initial vegetation.	***Not Required as of 10/14/99.*** Final reclamation of this area will be not be completed until the five lined Club Ranch Area Ponds and all underlying contaminated soils are removed and placed into the B-Plant Repository. This will not occur until ground water extraction activities stop in approximately 2003.
12. A Certification Report shall be submitted to the State.	Not later than 120 days after completion of all remediation activities at the Uravan site	***Not Required as of 10/14/99.*** All remediation activities at the Uravan site have not been completed.
13. Long-term monitoring and maintenance of the surface configuration and vegetation after closure of the Uravan Facility shall be conducted pursuant to the Colorado Radioactive Materials License.	After closure of Uravan facility	***Ongoing.***

4.3 River Ponds Area

4.3.1 History

The River Ponds Area, Figure 2-2, consisted of seven small ponds constructed along the San Miguel River adjacent to the mill. Five of the ponds were located on the mill side (south side) of the river and two ponds were located on the north side of the river adjacent to Highway 141. These ponds were constructed within old tailings piles by excavating into and, in some cases, through the tailings. The exposed surfaces of the excavations were then mantled with natural soils. The five ponds on the mill side of the river were used as settling basins for liquids collected within the mill area and stored there prior to discharge into the river. The two ponds on the north side of the river were used to clarify treated process liquors prior to discharge. These ponds contain neutralized sludge from the clarification operation. Umetco estimated that about 200,000 cubic yards of mill wastes and contaminated soils were contained in the River Ponds Area. Seepage of liquids from the River Ponds Area to the ground water, and eventually to the San Miguel River, was estimated at 10 to 40 gallons per minute when they were in use.

4.3.2 Remedial Objectives

In the RAP, the State selected excavation of all sludge and tailings and on-site disposal in the Tailings Piles on Club Mesa as the remedy for the River Ponds Area. The objectives of this remedy were to remove the source of potential future contamination of the ground water and the San Miguel River.

4.3.3 Site Status and RAP Requirements

4.3.3.1 Status December 1993 (Excerpted from EPA 1993 Five Year Review, Umetco 1997 Five Year Review, CDPHE 1999 Uravan Remedial Action Plan Status Report)

Initial removal of the ponds started in late 1988 and was completed in mid-1989. These materials were placed into Tailings Piles #1-2 and #3. Excavation was completed down to the water table. Umetco subsequently constructed rock berms to trap sediment carried by the San Miguel River during high flows. Vegetation has re-established itself at this site. The RAP called for final reclamation by December 31, 1991. A Final Construction Report was submitted to the State and approved in mid-1993.

This component was 100 percent complete as of December 1993.

4.3.3.2 Status October 1999 (Excerpted from Umetco 1997 Five Year Review, CDPHE 1999 Uravan Remedial Action Plan Status Report)

No further activity has been undertaken at this site since the last Five-Year Review was prepared. Umetco is currently conducting performance monitoring of this site as required by the RAP.

Remedial action at this site is 100 percent complete as of October 14, 1999.

Table 4.3.3-1 summarizes the major requirements for remedial activities at the River Ponds Area specified in Section 4.3.2 of the RAP, required completion dates as specified in Section 4.3.4 of the RAP, and status as of October 14, 1999.

4.3.4 Summary of Site Visit Observations and Findings

Visual observations during the on-site visits of October 13 and 14, 1999 found the River Ponds Area to be restored to a condition comparable to surrounding areas not included in the River Ponds Area. The San Miguel River has incorporated the River Ponds Area into its course. Vegetation had re-established itself and visually appeared to be very healthy. Tailings, discoloration, or other overt signs of contamination were not found during visual observation of this area.

4.3.5 Photographs

Photo 4.3-1 shows the River Ponds Area being remediated in May 1989, while Photo 4.3-2 shows the River Ponds Area cleanup complete in July 1989. Photo 4.3-3 illustrates the current status of the River Ponds Area as of October 1999.

Recommendations:

1. None noted

Table 4.3.3-1 River Ponds Area		
RAP Requirements	**Required Date of Completion**	**Site Status 10/14/99** ***Remedial Action at This Site 100% Completed as of 10/14/99***
1. All liquids from the River Ponds shall be removed.	12/31/87	***Completed*** - No information available for review as to actual completion date.
Tailings, neutralized sludge, and contaminated soils shall be removed, placed, compacted, and disposed on the tops of the Tailings Piles on Club Mesa in accordance with the Approved Final Plans and Specifications.	12/31/90	***Completed by mid-1989.*** Approximately 290,000 cubic yards of tailings, sludge, and soils were placed in Tailings Piles #1-2 and 3.
2. Excavation of contaminated materials until: **S** At least one foot of material is removed and scintillation measurements are less than 30 FR/hr; or **S** Sandstone or siltstone bedrock or the water table is encountered.	12/31/90	***Completed by mid-1989.*** Excavation continued until ground water was encountered at the approximate elevation of low winter flows in the San Miguel River.

Table 4.3.3-1 River Ponds Area		
RAP Requirements	**Required Date of Completion**	**Site Status 10/14/99** ***Remedial Action at This Site 100% Completed as of 10/14/99***
3. After excavation of contaminated soils, scintillometer surveys and soil assays for radionuclides and heavy metals to ascertain residual contamination levels shall be conducted unless sandstone or siltstone bedrock or the water table is encountered.	12/31/90	***Completed by mid-1989.*** Excavation continued until ground water was encountered at the approximate elevation of low winter flows in the San Miguel River.
4. Runoff controls shall be in place to prevent releases of hazardous materials.	12/31/90	Not discussed in documents reviewed during this Five-Year Review.
5. The River Ponds Area shall be regraded to contours that provide a stable ground surface configuration consistent with the goal of long-term stability and erosion resistance of the area.	12/31/91	***Not Required.*** Regrading, filling, and vegetation was not required as excavation removed materials below the average flow level of the San Miguel River.

Table 4.3.3-1 River Ponds Area		
RAP Requirements	**Required Date of Completion**	**Site Status 10/14/99** ***Remedial Action at This Site 100% Completed as of 10/14/99***
6. The River Ponds Area shall be covered with at least one (1) foot of random fill and shall be vegetated.	12/31/91	***Not Required.*** Regrading, filling, and vegetation was not required as excavation removed materials below the average flow level of the San Miguel River. Rock berms were constructed across the excavated areas to reduce river flow velocities and trap sediment carried by the river during high flows. Riparian vegetation re-established itself naturally in the River Ponds Area.
7. Regrading, filling, and vegetation shall not be required if excavation has removed materials below the average flow level of the San Miguel River.	12/31/91	***Not required.*** Regrading, filling, and vegetation was not required because excavation removed materials below the average flow level of the San Miguel River. Rock berms were constructed across the excavated areas to reduce river flow velocities and trap sediment carried by the river during high flows. Riparian vegetation re-established itself naturally in the River Ponds Area.

Table 4.3.3-1 River Ponds Area		
RAP Requirements	**Required Date of Completion**	**Site Status 10/14/99** ***Remedial Action at This Site 100% Completed as of 10/14/99***
8. If monitoring of the cover and vegetation performance, after completion of remedial activities but prior to closure of the Uravan Facility demonstrates that performance requirements as stated in the Quality Plan have not been met, Umetco shall implement additional State-approved remedial activities to achieve required performance.	As required	***Not required by the State as of 10/14/99.***
9. Final Construction Report shall be submitted to the State.	Not later than ninety (90) days after the completion of remedial activities at the River Ponds Area	***Completed***. Submitted to the State and approved in mid-1993
10. A Certification Report shall be submitted.	Not later than 120 days after completion of all remediation activities at the Uravan site	***Not Required as of 10/14/99.*** All remediation activities at the Uravan site have not been completed
11. Long-term monitoring and maintenance of the surface configuration and vegetation after closure of the Uravan Facility shall be conducted pursuant to the Colorado Radioactive Materials License.	After closure of Uravan facility	***Ongoing.***

4.4 Club Mesa Tailings Piles

4.4.1 History

The Club Mesa Tailings Piles at Uravan were started in the mid-1950s to store tailings generated by the Uravan Mill. The Tailings Piles are located on Club Mesa above the Mill Site, as shown in Figures 2-2 and 2-3. The Club Mesa Tailings Piles were constructed using the upstream method whereby the tailings slurry was pumped from the mill to the Tailings Piles and deposited through spigots placed along the tailings delivery line. The embankment raises are constructed from tailings sand that were regraded, placed, and compacted.

Prior to 1980, the downstream slopes on the tailings embankments varied from approximately 1.5 (H) to 1 (V) to 3 (H) to 1 (V). As the height of the embankments increased, there was concern for the stability of the embankments. Consequently, in 1980, rock fill berms including a drainage blanket for seepage control were constructed to buttress the lower portions of the Tailings Piles. Horizontal drains to promote drainage of the tailings were also installed but were ineffective.

Observed impacts from the existing tailings disposal system included seepage of contaminated liquids into the Club Mesa bedrock; erosion and transport of tailings material away from the disposal area by wind and water action; and radon emanation from the Tailings Piles.

4.4.2 Remedial Objectives

In the RAP, the State selected cessation of discharge to the Tailings Piles, removal of liquids, and the covering of the slopes of the Tailings Piles material prior to final reclamation as the remedy for the Tailings Piles. The objectives of this remedy were to minimize surface water infiltration, seepage from the Tailings Piles, wind and water erosion, and radon emanation from the Tailings Piles.

4.4.3 Site Status and RAP Requirements

4.4.3.1 Status December 1993 (Excerpted from EPA 1993 Five Year Review, Umetco 1997 Five Year Review, CDPHE 1999 Uravan Remedial Action Plan Status Report)

The RAP called for six remedial action components: (1) dewatering; (2) sloping and contouring; (3) constructing rock fill buttress and toe drain; (4) constructing side slope protective cover; (5) placing top covers; and (6) constructing drainage diversion.

Tailings Pile #3

Components 1 through 4 were completed as of December 1993. The top cover, except for riprap, had been placed on Tailings Pile #3. A portion of the diversion channel system had been constructed. ***Component 5 was 45 percent complete and Component 6 was 20 percent complete as of December 1993***.

Tailings Pile #1-2

The top of Tailings Pile #1-2 will act as the final repository for tailings and contaminated soils from valley areas and Club Mesa. All remaining tailings, soils, and liner materials from the final cleanup of the Club Ranch Evaporation Ponds will go to Tailings Pile #1-2. ***The placement of contaminated soils and other materials on Tailings Pile #1-2 was approximately 90 percent complete as of December 1993***.

Completion of the top slope cover for Tailings Pile #1-2 was scheduled for completion by December 31, 1996. Diversion channels were also scheduled for completion by December 31, 1995. It was thought that a small cell would need to be kept open to accept contaminated materials from the final reclamation of the Club Ranch Evaporation Ponds.

The entire tailings pile project was 96 percent complete as of December 1993.

4.4.3.2 Status October 1999 (Excerpted from Umetco 1997 Five Year Review, CDPHE 1999 Uravan Remedial Action Plan Status Report)

Tailings Pile #3

Components 1 through 4, as described above, are 100 percent completed. The entire first two layers of the top cover, e.g., the clay radon barrier and the clay frost barrier have been placed. The riprap armor barrier has yet to be placed on Tailings Pile #3. A portion of the diversion channel has been constructed. ***Placement of the top cover is 85 percent complete and drainage diversion construction is 20 percent complete as of October 14, 1999***.

In late 1993, a joint separation was identified at the northeast side of Tailings Pile #3, Figure 7.4.4-1. The joint separation is approximately 80 to 100 feet long and occurs at the north cliff in a near vertical rock face against which the tailings and overlying fill materials were placed. The depth of the separation varies from approximately five to sixteen feet. Umetco has conducted several studies of this joint separation and has determined that the joint separation is due to differential settling in an isolated area. In 1998, a detailed geotechnical investigation of the joint separation was conducted. As part of the investigation, ten exploratory borings were completed. Nine inclinometers and seven nested pneumatic piezometers were installed in seven of the borings completed in the tailings pile. The other three borings were completed in the sandstone abutment above the tailings pile. Umetco does not expect the separation to spread any further than its present state. According to Umetco personnel, they have completed studying remedial alternatives and will submit a final remedial action plan to the State for approval in the near future, although this date was not specified. The final remedial action plan had not been received by the State as of October 14, 1999.

Tailings Pile #1-2

The top of Tailings Pile #1-2 acted as the final repository for tailings and contaminated soils from valley areas and Club Mesa. The capacity of Tailings Pile #1-2 has been met. All remaining tailings, soils and liner materials from the final cleanup of the Club Ranch Evaporation Ponds will go to the new B-Plant Repository.

The placement of contaminated soils and other materials on Tailings Pile #1-2 is 100 percent complete.

Completion of the top slope cover for Tailings Pile #1-2 is scheduled for completion by December 31, 2002. This will allow Umteco to ensure that Tailings Pile #1-2 settlement and compaction has completed before they place the final cover. Diversion channels are also scheduled for completion by December 31, 2002. Contaminated materials removed during the final reclamation of the Club Ranch Evaporation Ponds will be placed in the new B-Plant Repository as will any other contaminated materials removed during the remainder of remedial actions at the Uravan facility, e.g., windblown materials.

The entire tailings pile project is 98 percent complete. The initial construction of the B-Plant Repository is 100percent complete.

An area of ground water seepage was identified during a State inspection conducted in early October 1999. This area was located approximately midway along the west side of the tailings pile, abutting the adjoining mesa. It initially appeared to be a small area of differential settling. However, when this area was excavated to a depth of approximately 8 to 10 feet, approximately 30 gallons per minute of ground water flowed out of several cracks in the mesa's sidewall. According to Umetco personnel, this area had never experienced ground water seepage throughout the working life of the tailings pile. However, precipitation during the summer of 1999 was very high, and this could be the cause of the seepage this year. The area on top of the mesa immediately adjacent to the west side of Tailings Pile #1-2 is part of the Club Mesa Area that has been completely remediated. A clay lined diversion ditch situated on Club Mesa along the west side of Tailings Pile #1-2 should divert surface water runoff away from the Tailings Pile and also minimize the potential for surface water infiltration into Tailings Pile #1-2. Umetco is currently planning to investigate this situation in the near future to identify the source of the seepage and appropriate mitigation measures.

Table 4.4.3-1 summarizes the major requirements for remedial activities at the Club Mesa Tailings Piles specified in Section 4.4.2 of the RAP, required completion dates as specified in Section 4.4.4 of the RAP, and status as of October 14, 1999.

4.4.4 Summary of Site Visit Observations and Findings

Tailings Pile #3

Tailings Pile #3 is closed and no longer receiving wastes. Sparse vegetation is growing on top of the clay frost barrier. The riprap armor has not been placed on the top of the pile. The top berm of the pile has a slope of approximately 5(H):1(V) as required by the RAP. The lower parts of the tailings pile berm have been sloped to approximately 3(H):1(V) and have received the final cover materials, including riprap. All surface water controls, diversion ditches, toe berms, sumps, and other flow control measures were in place, operating, and in conformance with RAP specifications. Riprap was in place on the south and east sides of the pile. The joint separation was viewed during the site visit. What appeared to be a new crack adjacent to the joint separation was observed. However, this new crack is probably only part of the overall joint separation existing in this area.

Tailings Pile #1-2

Tailings Pile #1-2 is no longer receiving wastes. None of the components of the final cover, e.g., clay radon barrier, clay frost barrier, or riprap armor, have been placed on top of Tailings Pile #1-2. The surface has

been graded for runoff. The top berm of the pile has a slope of approximately 5(H):1(V) as required by the RAP. The lower parts of the tailings pile berm have been sloped to approximately 3(H):1(V) and have received the final cover materials, including riprap. All surface water controls, toe berms, sumps, and other flow control measures were in place, operating, and in conformance with RAP specifications.

The ground water seepage identified during the State October 1999 inspection was viewed during this audit. The entire area was very wet, but it appeared that the ground water seep had slowed to a rate of approximately 5 gallons per minute exiting through five primary points in the rock wall. Water collected in a sump excavated around these points did not require pumping during the audit.

4.4.5 Photographs

Photos 4.4-1 and 4.4-2 show regrading and contouring of Tailings Pile #1-2 in May 1989. Photo 4.4-3 shows the top of Tailings Pile #3 as of October 1999. Photos 4.4-4 and 4.4-5 show the joint separation in Tailings Pile #3 as of October 1999. Photo 4.4-6 shows the status of the Tailings Pile #1-2 as of October 1999. Photo 4.4-7 shows the diversion ditch on top of Tailings Pile #1-2 as of October 1999. Photo 4.4-8 shows the south slope of Tailings Pile #1-2 as of October 1999. Photos 4.4-9 and 4.4-10 show the ground water seepage in Tailings Pile #1-2 as of October 1999.

Recommendations:

1. Tailings Pile #3
   - **S** Although the joint separation does not appear to negatively effect the overall stability of Tailings Pile #3, this opening does provide a pathway for infiltration of surface water and precipitation into the tailings pile. If the joint separation problem is not corrected, surface water infiltration could result in an increased amount of time for dewatering of the tailings pile. This problem should be corrected as soon as possible, and no later than 12/31/2000.
   - **S** Tailings Pile #3 should also be observed very closely for similar signs of seepage, as it also abuts the Club Mesa Area and could have the same types of cracks and fissures in the abutting wall that causes ground water infiltration into Tailings Pile #1-2.

2. Tailings Pile #1-2
   - **S** The presence of one seep into Tailings Pile #1-2 may indicate the presence of additional seeps. Because this seep was identified only a few weeks prior to this Five-Year Audit, it is too soon to know the potential seriousness of this problem and the overall effect on the stability of the Tailings

Pile. It does, however, indicate a potential source of additional water coming into the pile that may increase the overall time required to dewater the Tailings Pile. Umetco should immediately investigate this problem to determine the potential source(s) and mitigation measures. The necessity for constructing additional water diversion channels in the Club Mesa area above the Tailings Piles should be evaluated. It is essential that this investigation be conducted and remedial action alternatives, if necessary, evaluated and implemented as quickly as possible to ensure that the Tailings Pile is not compromised. It is recommended that these actions be completed no later than mid-2001 so that the Tailings Pile can be monitored prior to closure in December 2002.

Table 4.4.3-1 Club Mesa Tailings Piles		
RAP Requirements	**Required Date of Completion**	**Site Status 10/14/99**
1. Design and construct a dewatering system for all Tailings Piles that consists of shallow trenches, sump pumps, and placement of fill in designated areas on the Tailings Piles to surcharge these areas to accelerate dewatering and consolidation.	Shall commence by September 30, 1988	***Commenced by September 30, 1988.***
2. Design and construct slopes and contours of the Tailings Piles so that the sides of the Tailings Piles have been regraded to 3 (H): 1 (V) above the rock buttress and are being covered with an interim soil cover eighteen (18) inches thick at a minimum. Placement of neutralized sludges and contaminated soils in the Tailings Piles shall be in appropriate lifts of an approved thickness and compacted in accordance with Approved Final Plans and Specifications.	Completed when the final Consent Decree and RAP were issued in 1987 River Ponds material: December 31, 1990 Club Mesa material: December 31, 1994	***Completed when the Final Consent Decree and RAP were issued in 1987.*** ***Completed by mid-1989.*** ***Completed by December 31, 1994.***
3. Neutralized sludges and contaminated soils shall be placed in select locations on top of the Tailings Piles at an outer slope of 5 (H): 1 (V) or less.	At all times the material is placed	Information regarding this requirement not discussed in documents reviewed during this Five-Year Review.

Table 4.4.3-1 Club Mesa Tailings Piles		
RAP Requirements	**Required Date of Completion**	**Site Status 10/14/99**
4. Tops of the Tailings Piles shall be contoured to slope at three (3) percent grade away from the embankment face. The surface shall be cambered in defined areas to compensate for settlement of the underlying slimes.	Not specified in the RAP	Information regarding this requirement not discussed in documents reviewed during this Five-Year Review.
5. The Rock Fill Buttress and Toe Drain System shall be designed and constructed so that the existing rock fill buttress is covered with 1.2 meters of Type A riprap or as determined during final design and presented in the Approved Plans and Specifications.	Not specified in the RAP	***Completed by December 31, 1993.***
The toe drain system presently in place at the base of the Tailings Piles shall be maintained until seepage ceases. Seepage shall be collected and disposed of in the lined Club Ranch Ponds.	Not specified in the RAP	***Ongoing***
Cover for the rock fill buttress shall be obtained from the Burbank Quarry or State-approved alternative source. Placement and inspection of these materials shall be conducted in accordance with the approved Quality Control/Quality Assurance Program.	Not specified in the RAP	Cover was obtained from the Burbank Quarry or the Surprise Borrow Area on Club Mesa.

Table 4.4.3-1 Club Mesa Tailings Piles		
RAP Requirements	**Required Date of Completion**	**Site Status 10/14/99**
6. The side slope protective cover shall be designed and constructed according to the specified slope, minimum thickness requirements and material specifications.		
The cover on the 3 (H): 1 (V) portion of the slope shall consist of 0.9 meters of compacted clay, 0.9 meters of random fill, and 1.2 meters of riprap for a total cover thickness of 3.0 meters.	December 31, 1989	***Completed by December 31, 1989.***
The cover on the 5 (H): 1 (V) portion of the slope will consist of 0.9 meters of compacted clay, 1.5 meters of random fill, and 0.6 meters of riprap, or as determined during final design, for a total cover thickness of 3.0 meters.	As soon as final settlement will not affect cap integrity	***Completed by December 31, 1989.***

Table 4.4.3-1 Club Mesa Tailings Piles		
RAP Requirements	**Required Date of Completion**	**Site Status 10/14/99**
7. Top Cover: The top cover shall consist of 0.9 meters of compacted clay, 1.8 meters of random fill, and 0.3 meters of Type B riprap for a total of 3.0 meters measured perpendicular to the slope.	Clay and random fill covers shall be in place by December 31, 1996	Tailings Pile #3: ***Ongoing***, 85% complete. Compacted clay and random fill placed. Riprap will be placed when settlement of tailings pile is complete. Tailings Pile #1-2: ***Ongoing***, Completion of the Top slope cover is scheduled for completion by December 31, 2002.
Riprap, random fill, and clays shall be obtained from the Burbank Quarry, the Borrow Area on Club Mesa, or a State-approved alternative source.	At all times during remedial activities	***Ongoing***, Riprap, random fill, and clays were obtained from the Burbank Quarry or the Surprise Borrow Area on Club Mesa.
8. Drainage Diversion: The Club Mesa Spray Area runoff shall be directed away from the Tailings Piles.	Permanent drainage channels will be operational by December 31, 1996	Tailings Pile #3: ***Ongoing***, 20% complete. A portion of the drainage channel has been completed. Scheduled for completion by December 31, 2002. Tailings Pile #1-2: ***Ongoing***, Scheduled for completion by December 31, 2002.

Table 4.4.3-1 Club Mesa Tailings Piles		
RAP Requirements	**Required Date of Completion**	**Site Status 10/14/99**
Drainage from areas adjacent to the Tailings Piles shall be intercepted by a drainage ditch at the back of the piles and conveyed through channels to a gully. Riprap shall be sized to withstand the probable maximum flood velocities across the piles and shall be obtained from the Burbank Quarry or State-approved alternate source.		***Ongoing.***
Surface runoff from the top of the Tailings Piles shall be directed away from the embankment face and shall be collected and conveyed by the drainage ditch and channels to an existing gully.		***Ongoing.***
Surface runoff from faces of the embankments shall be collected at the base of the embankments and conveyed to the cliff face where long-term cliff retreat shall not impact the disposal site. These collection channels shall consist of a minimum of 4 feet of Type A riprap overlying 1 foot of riprap bedding.		

Table 4.4.3-1 Club Mesa Tailings Piles		
RAP Requirements	**Required Date of Completion**	**Site Status 10/14/99**
9. A final construction report shall be submitted to the State not later than ninety (90) days after the final placement of riprap on the top of the Tailings.	Ninety (90) days after the final placement of riprap on the top of the Tailings Piles	***Not required to-date.*** Final placement of riprap on top of Tailings Piles has not occurred.
10. A Certification Report shall be submitted to the State not later than 120 days after completion of all remedial activities at the Uravan Facility.	120 days after completion of all remedial activities at the Uravan Facility	***Not required to-date***. Remedial activities not completed.
11. Monitoring of the Tailings Pile shall be conducted for: **S** Dewatering rates, quantities, and quality **S** Slope stability, including surface monuments and any required slope indicators **S** Piezometer levels **S** Toe drain effluent rates, quantities and quality **S** Siltation in runoff collection channels **S** Monitoring of the rock fill buttress, side slope cover, and drainage diversion channels.	Ongoing	***Ongoing.***

Table 4.4.3-1 Club Mesa Tailings Piles		
RAP Requirements	**Required Date of Completion**	**Site Status 10/14/99**
12. Performance of the remedial activities shall be evaluated to assure long-term stability, cover integrity, and the decline of seepage over time by analysis of: **S** Settlement rates **S** Toe drain seepage rates **S** Movement monuments, erosion monument, and slope indicator data, if required **S** Aerial photography (after all remedial activities are complete).	Ongoing	***Ongoing.*** Aerial photographs not required as remedial actions at the site are not completed.
13. Long-term monitoring and maintenance after closure of the Uravan Facility shall be conducted pursuant to the Colorado Radioactive Materials License.	After closure of the Uravan facility	***Not required to-date.*** Uravan Facility has not closed.

4.5 Club Mesa Area

4.5.1 History

The Club Mesa Area is located upslope from Tailings Piles #1-2 and 3, as shown in Figures 2-2 and 2-3. This area was used primarily for evaporation of raffinate. Mounds of raffinate crystals formed around the spray nozzles within the spray areas. As part of the raffinate spray process, two clay-lined storage ponds were constructed upslope of the raffinate spray area. The purpose of these ponds was to provide hydrostatic head for the spray system. Neutralized sludge excavated from the River Ponds was also present in the Club Mesa Area.

Umetco estimated that approximately 484,000 cubic yards of contaminated materials were present in the Club Mesa Disposal Area. These materials included 250,000 cubic yards of raffinate crystals; 150,000 cubic yards of neutralized sludge; 40,000 cubic yards of contaminated pond material; and 44,000 cubic yards of contaminated soils in the fringe area.

Surficial and subsurface contamination occurred as a result of the raffinate spray process. Surficial contamination is due to the presence of the raffinate crystals, in addition to the windblown spray which contaminated soils in the adjacent fringe area. Subsurface contamination is caused by seepage of excess spray liquids into the underlying soils and bedrock through the unlined surface of the spray area.

4.5.2 Remedial Objectives

In the RAP, the State selected excavation and on-site disposal of raffinate crystals in the Burbank Quarry, an approved raffinate crystal storage area, and disposal of other contaminated solids in the Tailings Piles on Club Mesa as the remedy for the Club Mesa Area. The objective of this remedy were to remove the source of future potential contamination of surrounding soils and the underlying soils and bedrock.

4.5.3 Site Status and RAP Requirements

4.5.3.1 Status December 1993 (Excerpted from EPA 1993 Five Year Review, Umetco 1997 Five Year Review, CDPHE 1999 Uravan Remedial Action Plan Status Report)

Initial removal of crystals from the Club Mesa Area began in the summer of 1990 and was completed in mid-1992. The final removal of the crystals that are resting on bedrock has yet to be performed. Removal of sludges and other material commenced in the fall of 1989 and continues. The RAP calls for removal of contaminated materials by December 31, 1994, with final reclamation by December 31, 1995.

This component was approximately 80 percent complete as of December 1993.

The status of the underground mines and portals was not discussed by CDPHE in December of 1993.

4.5.3.2 Status October 1999 (Excerpted from Umetco 1997 Five Year Review, CDPHE 1999 Uravan Remedial Action Plan Status Report)

Approximately 350,000 cubic yards of contaminated materials were removed from Club Mesa prior to the completion of final reclamation on December 31, 1997 (the original completion date of December 31, 1994 was extended to December 31, 1997 by a modification to the RAP). Excavation of this area continued down to the underlying bedrock. Mines and portals encountered during construction were sealed with earthen material per the RAP. An erosion resistant rock/soil cover was added to a portion of the area to control runoff. The RAP was modified in 1999 to require Umetco to evaluate the feasibility of dewatering the mines to minimize uncontrolled releases of contaminated ground water.

Remedial action at this site is 100 percent complete as of October 14, 1999.

The Final Construction Report for the Club Mesa Disposal Area was submitted to the State for approval, in August 1997 and was approved in February 1998.

Table 4.5.3-1 summarizes the major requirements for remedial activities at the Club Mesa Disposal Area specified in Section 4.5.2 of the RAP, required completion dates as specified in Section 4.5.4 of the RAP, and status as of October 14, 1999.

4.5.4 Summary of Site Visit Observations and Findings

Visual inspection during the site visits of October 13 and 14, 1999 indicated that the Club Mesa Area is fully remediated. No signs of remaining contamination, e.g., crystals, discolored soil, ponds, etc., were observed during the visit. Vegetation was beginning to re-establish itself on the mesa, especially on the

rock/soil cover. The vegetation appeared to be healthy. No open mines or portals were observed in the Club Mesa Area, although several open mines and portals were observed in the off-site areas not owned, operated, or under the control of Umetco.

4.5.5 Photographs

Photos 4.5-1 and 4.5-2 show the cleanup of the Club Mesa Disposal Area in May 1989. Photos 4.5-3 and 4.5-4 show the Club Mesa Disposal Area as of October 1999.

Recommendations:

1. None noted.

Table 4.5.3-1 Club Mesa Disposal Area		
RAP Requirements	**Required Date of Completion**	**Site Status 10/14/99** ***Remedial Actions at This Site 100% Completed as of 10/14/99***
1. The following remedial activities shall be conducted in the Club Mesa Spray Area:		
S Remove 250,000 cubic yards of raffinate crystals and 84,000 cubic yards of contaminated soils in the spray area and contaminated fringe area, respectively.	12/31/94	***Completed by 12/31/94***. Approximately 375,000 cubic yards of raffinate crystals, neutralized sludge, and other contaminated materials were removed from Club Mesa.
S Dispose the raffinate crystals in the secure crystal repository, the Burbank Quarry and compact them in accordance with the Approved Final Plans and Specifications.	12/31/94	***Completed by 12/31/94.***
S Excavate, place, compact, and dispose all contaminated soils beneath the crystals and spray contaminated fringe areas on the tops of the Club Mesa Tailings Piles in accordance with the Approved Final Plans and Specifications. At least one (1) foot of material and all surficial materials with greater than 20 percent by volume raffinate crystals and scintillometer readings greater than 30 FR/hr shall be excavated. Excavation may stop when sandstone or siltstone bedrock is encountered.	12/31/94	***Completed by 12/31/94***. Excavation removed materials down to underlying bedrock.

Table 4.5.3-1 Club Mesa Disposal Area			
RAP Requirements		**Required Date of Completion**	**Site Status 10/14/99** ***Remedial Actions at This Site 100% Completed as of 10/14/99***
S	Scintillometer surveys and soil assays for radionuclides and heavy metals shall be conducted after excavation is completed. If bedrock is encountered, soil sampling is not necessary.	12/31/94	***Completed by 12/31/94***. Scintillometer surveys were conducted. Soil samples were not required as excavation removed materials down to the underlying bedrock.
S	A drainage control system and radon cover shall be designed for the Club Mesa Spray Area and Contaminated Fringe Area unless excavation stopped when sandstone or siltstone bedrock was encountered.	Not specified in RAP	***Not required.*** Excavation removed materials down to underlying bedrock
S	Runoff controls shall be in place during remedial activities.	Not specified in RAP	Not discussed in documents reviewed during this Five-Year Review.
S	Runoff control structures on the Club Mesa Spray Area and Contaminated Fringe Area shall be designed to direct runoff away from the Tailings Piles.	9/30/93 RAP modification permitted completion by 12/31/97	***Completed by 12/31/97.***
S	The graded area shall be covered with at least one (1) foot of random fill and shall be vegetated in accordance with a program approved by the State unless bedrock is exposed and all applicable radon and other public health standards and criteria are met, the random fill is not required.	12/31/95 RAP modification permitted completion by 12/31/97	***Completed by 12/31/97.***

Table 4.5.3-1 Club Mesa Disposal Area		
RAP Requirements	**Required Date of Completion**	**Site Status 10/14/99** ***Remedial Actions at This Site 100% Completed as of 10/14/99***
S If monitoring of the cover and vegetation performance, after completion of remedial activities but prior to closure of the Uravan Facility demonstrates that performance requirements as stated in the Quality Plan have not been met, Umetco shall implement additional State-approved remedial activities to achieve required performance criteria.	As required	***Not required to-date by State.***

Table 4.5.3-1 Club Mesa Disposal Area		
RAP Requirements	**Required Date of Completion**	**Site Status 10/14/99** ***Remedial Actions at This Site 100% Completed as of 10/14/99***
2. The following remedial activities shall be conducted in the Neutralized Sludge Disposal Area:		
S Remove 150,000 cubic yards of neutralized sludge stored on Club Mesa and place, compact, and dispose	12/31/94	***Completed by 12/31/94.*** Approximately 375,000 cubic yards of raffinate crystals, neutralized sludge, and other contaminated materials were removed from Club Mesa.
S Excavate, place, compact, and dispose all neutralized sludge on the tops of the Club Mesa Tailings Piles in accordance with the Approved Final Plans and Specifications.	12/31/94	***Completed 12/31/94.***
S Excavate, place, compact, and dispose all contaminated soils beneath the neutralized sludge and place it on the tops of the Club Mesa Tailings Piles in accordance with the Approved Final Plans and Specifications. At least one (1) foot of material and all surficial materials with greater than 20 percent by volume raffinate crystals and scintillometer readings greater than 30 FR/hr shall be excavated. Excavation may stop when sandstone or siltstone bedrock is encountered.	12/31/94	***Completed by 12/31/94.*** Excavation removed materials down to underlying bedrock.

Table 4.5.3-1 Club Mesa Disposal Area		
RAP Requirements	**Required Date of Completion**	**Site Status 10/14/99** ***Remedial Actions at This Site 100% Completed as of 10/14/99***
S Scintillometer surveys and soil assays for radionuclides and heavy metals shall be conducted after excavation is completed. If bedrock is encountered, soil sampling is not necessary.	12/31/94	***Completed by 12/31/94.*** Scintillometer surveys conducted. Soil samples not required as excavation removed materials down to underlying bedrock.
S A drainage control system and radon cover shall be designed for the Neutralized Sludge Disposal Area or unless excavation stopped when sandstone or siltstone bedrock was encountered.	Not specified in RAP	***Not required.*** Excavation removed materials down to the underlying bedrock.
S Runoff controls shall be in place during remedial activities.	9/30/93 RAP modification permitted completion by 12/31/97	Not discussed in documents reviewed during this Five-Year Review.
S Runoff control structures on the Neutralized Sludge Disposal Area shall be designed to direct runoff away from the Tailings Piles.	12/31/95 RAP modification permitted completion by 12/31/97	***Completed by 12/31/97.***

Table 4.5.3-1 Club Mesa Disposal Area		
RAP Requirements	**Required Date of Completion**	**Site Status 10/14/99** ***Remedial Actions at This Site 100% Completed as of 10/14/99***
S The graded area shall be covered with at least one (1) foot of random fill and shall be vegetated in accordance with a program approved by the State. If bedrock is exposed and all applicable radon and other public health standards and criteria are met, the random fill is not required.	RAP modification permitted completion by 12/31/97	***Completed by 12/31/97.***
S If monitoring of the cover and vegetation performance, after completion of remedial activities but prior to closure of the Uravan Facility demonstrates that performance requirements as stated in the Quality Plan have not been met, Umetco shall implement additional State-approved remedial activities to achieve required performance criteria.	As required	***Not required to-date by the State***.

Table 4.5.3-1 Club Mesa Disposal Area		
RAP Requirements	**Required Date of Completion**	**Site Status 10/14/99** ***Remedial Actions at This Site 100% Completed as of 10/14/99***
3. The following remedial activities shall be conducted in the Storage Ponds Area:		
S Excavate and remove 40,000 cubic yards of raffinate crystals and contaminated pond material from the Storage Ponds Area. The materials shall be placed, compacted, and disposed of in accordance with the Approved Final Plans and Specifications.	12/31/94	***Completed by 12/31/94.*** Approximately 375,000 cubic yards of raffinate crystals, neutralized sludge, and other contaminated materials were removed from Club Mesa.
S Excavate, place, compact, and dispose all contaminated soils beneath the Storage Ponds and place it on the tops of the Club Mesa Tailings Piles in accordance with the Approved Final Plans and Specifications. At least one (1) foot of material and all surficial materials with greater than 20 percent by volume raffinate crystals and scintillometer readings greater than 30 FR/hr shall be excavated. Excavation may stop when sandstone or siltstone bedrock is encountered.	12/31/94	***Completed by 12/31/94.*** Excavation removed materials down to the underlying bedrock.

Table 4.5.3-1 Club Mesa Disposal Area		
RAP Requirements	**Required Date of Completion**	**Site Status 10/14/99** ***Remedial Actions at This Site 100% Completed as of 10/14/99***
S Scintillometer surveys and soil assays for radionuclides and heavy metals shall be conducted after excavation is completed. If bedrock is encountered, soil sampling is not necessary.	12/31/94	***Completed by 12/31/94.*** Scintillometer surveys were conducted. Soil samples were not required as excavation removed materials down to the underlying bedrock.
S A drainage control system and radon cover shall be designed for the Storage Ponds Area that meets applicable State requirements or unless excavation stopped when sandstone or siltstone bedrock was encountered.	Not specified in RAP	***Completed by 12/31/97.***
S Runoff controls shall be in place during remedial activities to prevent releases of hazardous substances.	Not specified in RAP	Not discussed in documents reviewed during this Five-Year Review..
S Runoff control structures on the Storage Ponds Area shall be designed to direct runoff away from the Tailings Piles.	12/31/95 RAP modifications permitted completion by 12/31/97	***Completed by 12/31/97.***

Table 4.5.3-1 Club Mesa Disposal Area		
RAP Requirements	**Required Date of Completion**	**Site Status 10/14/99** ***Remedial Actions at This Site 100% Completed as of 10/14/99***
S The graded area shall be covered with at least one (1) foot of random fill and shall be vegetated in accordance with a program approved by the State. If bedrock is exposed and all applicable radon and other public health standards and criteria are met, the random fill is not required.	12/31/95 RAP modifications permitted completion by 12/31/97	***Completed by 12/31/97.***
S If monitoring of the cover and vegetation performance, after completion of remedial activities but prior to closure of the Uravan Facility demonstrates that performance requirements as stated in the Quality Plan have not been met, Umetco shall implement additional State-approved remedial activities.	As required	***Not required to-date by the State.***

Table 4.5.3-1 Club Mesa Disposal Area		
RAP Requirements	**Required Date of Completion**	**Site Status 10/14/99** ***Remedial Actions at This Site 100% Completed as of 10/14/99***
4. The following remedial activities shall be conducted in the Underground Mines and Portals:		
S All subsided areas shall be filled with appropriate earth materials and compacted or graded in accordance with Approved Final Plans and Specifications	12/31/94	***Completed by 12/31/94.*** Subsided areas were filled with earthen materials and compacted or graded.
S All exposed mine portals shall be sealed in accordance with the Approved Final Plans and Specifications.	12/31/94	***Completed by 12/31/94.*** Mines and portals were sealed with earthen materials.
5. The Final Construction Report shall be submitted to the State.	Not later than ninety (90) days after the completion of vegetation at the Club Mesa Disposal Area	***Completed.*** The Final Construction Report was submitted in August 1997 and approved by the State in February 1998.
6. A Certification Report shall be submitted to the State.	Not later than 120 days after completion of all remediation activities at the Uravan site	***Not Required as of 10/14/99.*** All remediation activities at the Uravan site have not been completed.

Table 4.5.3-1 Club Mesa Disposal Area		
RAP Requirements	**Required Date of Completion**	**Site Status 10/14/99** ***Remedial Actions at This Site 100% Completed as of 10/14/99***
7. Long-term monitoring and maintenance of the surface configuration, vegetation, and ground water shall be conducted pursuant to the Colorado Radioactive Materials License.	After closure of Uravan facility	***Ongoing.***

4.6 Mill Areas

4.6.1 History

The Mill Areas shown in Figures 2-2 and 2-3 include the A-Plant in the valley northwest of the Tailings Piles; the B-Plant, Ore Stockpile Area, Barrel Storage Area, a Heap Leach site on a bench below and east of Tailings Pile 2, and a Bone Yard for miscellaneous scrap plant equipment located west of Tailings Pile 2. These areas had all been impacted by the presence of radioactive materials.

4.6.2 Remedial Objectives

In the RAP, the State selected excavation and on-site disposal of contaminated equipment, structure, waste materials, contaminated soils and ancillary contaminated materials into the Tailings Piles, the Burbank Quarry, or a disposal site in the Elk Claim Area as the remedy for the Mill Areas. The objectives of this remedy were to remove the source of future potential contamination of surrounding soils and the underlying soils and bedrock.

4.6.3 Site Status and RAP Requirements

4.6.3.1 Status December 1993 (Excerpted from EPA 1993 Five Year Review, Umetco 1997 Five Year Review, CDPHE 1999 Uravan Remedial Action Plan Status Report)

Removal of contaminated materials from the Ore Stockpile Area, the Barrel Storage Area, Heap Leach Area, and Boneyard area occurred during the period from early 1987 to late 1988. Remediation of the Ore Stockpile was completed in 1989. In these areas, approximately 160,000 cubic yards of contaminated soils were removed down to bedrock. In 1990 and 1991, seven thickener tanks were removed from the B-Plant Area for health and safety reasons. Uranium and vanadium ores and mill reagents were sent to the White Mesa uranium facility in Utah. Umetco submitted a plan to CDPHE for decommissioning in October 1992. A completeness review was performed by the CDPHE and comments were sent to Umetco. The State informed Umetco that a decommissioning plan addressing radiation exposure to workers must be submitted under the existing radioactive materials license.

This entire project was 10 percent complete as of December 1993.

4.6.3.2 Status October 1999 (Excerpted from Umetco 1997 Five Year Review, CDPHE 1999 Uravan Remedial Action Plan Status Report)

Umetco initiated A-Plant and B-Plant decommissioning activities in 1995. This involved demolition of uranium/vanadium milling systems and ancillary facilities located along the San Miguel River valley floor at the base of Club Mesa and facilities located on the canyon face and lower bench immediately adjacent to the tailings piles. Contaminated soils were also removed. The mill system included ore receiving bins and crushing/sampling plant, aerofall grinding circuit, crushed and ground ore storage bins, hot sulfuric acid leach circuit, counter-current decantation circuit, sulfuric acid generation plant, uranium ion exchange circuit, uranium precipitation and calcining circuits, vanadium salt roast leach circuit, vanadium fusion circuit, metallurgical control laboratory, and solution transfer system. The mill system also included ancillary facilities such as reagent storage and mix systems, fuel supply systems, steam generation systems, electrical supply systems, equipment maintenance systems, and office and warehouse systems. Operative systems included maintenance, office, warehouse, electrical, and liquid transfer systems. Verification gamma surveys and soil sampling of both the A-Plant and B-Plant were initiated during the second quarter of 1999.

Mill demolition is 100 percent complete as of October 14, 1999. Removal of contaminated soils from the A- and B-Plants is 100 percent complete as of October 14, 1999.

During the period of 1997 to 1998, approximately 100,000 cubic yards of contaminated soil was removed from an area known as "Treasure Island" bounded by Hieroglyphic Canyon and County Road EE-22. This material was placed in Tailings Pile #1-2 for disposal. ***This activity is 100 percent complete as of October 14, 1999.***

Beginning in the third quarter of 1998, Runoff Control Ponds RC-1 through RC- 4 located in the A-Plant were replaced with new Runoff Control Ponds RC-1, RC-2 and RC-4. The new Runoff Control Pond RC-2 was placed into service in the fourth quarter of 1998. In the first quarter of 1999, the new lined Runoff Control Pond RC-4 was placed into service and the old RC-4 (a.k.a.., the Swimming Pool) was demolished. RC-1 had not been placed into service as of October 14, 1999.

The Final Construction Report has not been submitted to the State for approval as required by the RAP.

Table 4.6.3-1 summarizes the major requirements for remedial activities at the Mill Area specified in Section 4.6.2 of the RAP, required completion dates as specified in Section 4.6.4 of the RAP, and status as of October 14, 1999.

4.6.4 Summary of Site Visit Observations and Findings

The site visits of October 13 and 14, 1999 visually found the Mill Area to be remediated. All buildings have been demolished and areas had been excavated down to underlying bedrock. No visible signs of remaining contamination, e.g., buildings, drums, equipment, discolored soil, ore, etc., were observed in the B-Plant on top of the Club Mesa or at the base of the Mesa, e.g., A-Plant Area, during the visit. Vegetation was beginning to re-establish itself on the mesa. The small amounts of vegetation present appeared to be healthy. Vegetation was also starting to re-establish itself in the A-Plant Area. It also appeared to be sparse but healthy.

4.6.5 Photographs

Photos 4.6-1 and 4.6-2 show the A-Plant in May 1989. Photos 4.6-2 and 4.6-3 show the B-Plant in May 1989. Photos 4.6-4 and 4.6-5 show the A-Plant Area in October 1999. Photos 4.6-6 and 4.6-7 show the B-Plant in October 1999. Photo 4.6-8 shows the Former Boneyard as of October 1999.

Recommendations:

1. The Final Construction Report should be submitted to the State as soon as possible.

Table 4.6.3-1 Mill Areas		
RAP Requirements	**Required Date of Completion**	**Site Status 10/14/99** ***Remedial Actions Completed by 10/14/99***
1. The following remedial activities shall be conducted in the A- and B-Plants:		
S Uncontaminated equipment, structures, and waste materials from mill decommissioning may be disposed of by sale, transferred to other UCC/Umetco facilities, transferred to an appropriate off-site solid waste site, or disposed in the Tailings Pile, the Burbank Quarry or a disposal site in the Elk Claim Area.	Within 3 years of notifying State of intent to decommission. RAP modification required completion by 12/31/99	***Completed in 1999*** Mill decommissioning was initiated in 1995 and was completed in 1999.
S Contaminated equipment, structures and waste materials from mill decommissioning, contaminated soils underlying the mill areas, and ancillary contaminated materials shall be disposed of in the Tailings Pile, the Burbank Quarry, or a disposal site in the Elk Claim Area.	Within 3 years of notifying State of intent to decommission. RAP modification required completion by 12/31/99	***Completed in 1999*** Mill decommissioning was initiated in 1995 and was completed in 1999.
S Excavation of contaminated soils in the A- and B-Plants shall continue until scintillometer readings are less than 30 FR/hr or until sandstone or siltstone bedrock is encountered. Materials shall be excavated, placed, and disposed on the Tailings Piles.	Within 3 years of notifying State of intent to decommission. RAP modification required completion by 12/31/99	***Completed in 1999*** Excavation removed materials down to underlying bedrock.

Table 4.6.3-1 Mill Areas		
RAP Requirements	**Required Date of Completion**	**Site Status 10/14/99** ***Remedial Actions Completed by 10/14/99***
S Scintillometer surveys and soil assays for radionuclides and heavy metals shall be conducted after excavation is completed. If bedrock is encountered, soil sampling is not necessary.	Within 3 years of notifying State of intent to decommission. RAP modification required completion by 12/31/99	***Ongoing*** Scintillometer surveys of A- and B-Plants initiated in second and third quarters 1999, respectively. Soil samples not required in B-Plant as excavation removed materials down to underlying bedrock. Soil sampling in A-Plant initiated in second quarter 1999.
S Runoff controls shall be in place during remedial activities to prevent releases of hazardous substances.	During remedial activities	Not discussed in documents reviewed during this Five-Year Review.
S The A- and B-Plants Areas shall be graded and vegetated to minimize soil erosion, except where bedrock is exposed at the surface.	RAP modification required completion by 12/31/99	***Not required.*** Excavation was taken to underlying bedrock.
S If monitoring of the cover and vegetation performance, after completion of remedial activities but prior to closure of the Uravan Facility demonstrates that performance requirements as stated in the Quality Plan have not been met, Umetco shall implement additional State-approved remedial activities to achieve required performance.	As required	***Not required to-date by the State.***

Table 4.6.3-1 Mill Areas		
RAP Requirements	**Required Date of Completion**	**Site Status 10/14/99** ***Remedial Actions Completed by 10/14/99***
2. The following remedial activities shall be conducted in the Ore Stockpile Area:		
S Contaminated surface materials in the Stockpile Area will be shipped to the White Mesa Mill at Blanding, Utah or disposed of by sale, transferred to other UCC/Umetco facilities, transferred to an appropriate off-site solid waste site, or disposed in the Tailings Piles, the Burbank Quarry, or a disposal site in the Elk Claim Area.	Within 3 years of notifying State of intent to decommission. RAP modification required completion by 12/31/99	***Completed in 1989.*** Uranium/vanadium ores were relocated and processed at the White Mesa Mill in Utah.
S Excavation of contaminated soils in the Ore Stockpile Area shall continue until scintillometer readings are less than 30 FR/hr or until sandstone or siltstone bedrock is encountered. Materials shall be excavated, placed, and disposed on the Tailing Piles.	Within 3 years of notifying State of intent to decommission. RAP modification required completion by 12/31/99	***Completed in 1989.*** Excavation removed materials down to underlying bedrock.
S Scintillometer surveys and soil assays for radionuclides and heavy metals shall be conducted after excavation is completed. If bedrock is encountered, soil sampling is not necessary.	Within 3 years of notifying State of intent to decommission. RAP modification required completion by 12/31/99	***Completed in 1989.*** Scintillometer survey conducted. Soil sampling not required as excavation removed materials down to underlying bedrock.

Table 4.6.3-1 Mill Areas		
RAP Requirements	**Required Date of Completion**	**Site Status 10/14/99** ***Remedial Actions Completed by 10/14/99***
S Runoff controls shall be in place during remedial activities to prevent releases of hazardous substances.	Not specified in RAP	Not discussed in documents reviewed during this Five-Year Audit
S The Ore Stockpile Area shall be graded and vegetated to minimize soil erosion, except where bedrock is exposed at the surface.	Within 3 years of notifying State of intent to decommission. RAP modification required completion by 12/31/99	***Not required.*** Excavation down to underlying bedrock.
S If monitoring of the cover and vegetation performance, after completion of remedial activities but prior to closure of the Uravan Facility demonstrates that performance requirements as stated in the Quality Plan have not been met, Umetco shall implement additional State-approved remedial activities to achieve required performance.	As required	***Not required to-date by the State***.

Table 4.6.3-1 Mill Areas		
RAP Requirements	**Required Date of Completion**	**Site Status 10/14/99** ***Remedial Actions Completed by 10/14/99***
3. The following remedial activities shall be conducted in the Barrel Storage Area:		
S Ship barrels containing feed material to the White Mesa Mill or to another UCC/Umetco facility for processing	12/31/87	***Completed in 1988.*** Materials sent to the White Mesa Mill.
S Transfer barrels containing intermediate process materials to the White Mesa Mill or other licensed facility for processing, or shall move them to disposal on the Tailings Pile. After any limited processing of materials authorized by the Colorado Radioactive Materials License, the solid wastes shall be disposed on the Tailings Pile and the liquid wastes shall be temporarily stored in the existing tanks and finally disposed by evaporation in the lined Club Ranch Ponds.	12/31/87	***Completed in 1988.*** Materials sent to the White Mesa Mill.
S Dispose hazardous wastes in accordance with relevant regulations at an off-site disposal site.	12/31/87	***Completed in 1988.***
S Dispose analytical pulps on the Tailings Piles.	12/31/87	***Completed in 1988.***
S Ship exploration samples to the White Mesa Mill for processing or move them to disposal on the Tailings Piles.	12/31/87	***Completed in 1988.***
S Move non-hazardous waste materials to disposal on the Tailings Piles.	12/31/87	***Completed in 1988.***

Table 4.6.3-1 Mill Areas		
RAP Requirements	**Required Date of Completion**	**Site Status 10/14/99** ***Remedial Actions Completed by 10/14/99***
S Contaminated soils in the Barrel Storage shall be excavated. Excavation of contaminated soils in the Barrel Storage Area shall continue until scintillometer readings are less than 30 FR/hr or until sandstone or siltstone bedrock is encountered. Materials shall be excavated, placed, and disposed on the Tailing Piles.	Not later than completion of mill decommissioning	***Completed in 1988.***
S Scintillometer surveys and soil assays for radionuclides and heavy metals shall be conducted after excavation is completed. If bedrock is encountered, soil sampling is not necessary.	Not later than completion of mill decommissioning	***Completed in 1988.*** Scintillometer surveys conducted. Soil samples not required as excavation removed materials down to underlying bedrock.
S Runoff controls shall be in place during remedial activities to prevent releases of hazardous substances.	At all times during remediation	Not discussed in documents reviewed during this Five-Year Review.
S If monitoring of the cover and vegetation performance, after completion of remedial activities but prior to closure of the Uravan Facility demonstrates that performance requirements as stated in the Quality Plan have not been met, Umetco shall implement additional State-approved remedial activities to achieve required performance.	As required	***Not required to-date by the State***.

Table 4.6.3-1 Mill Areas		
RAP Requirements	**Required Date of Completion**	**Site Status 10/14/99** ***Remedial Actions Completed by 10/14/99***
4. The following remedial activities shall be conducted in the Heap Leach Site:		
S UCC/Umetco shall ship approximately 15,000 tons of partially processed ore to the White Mesa Mill for processing or shall move it to disposal on the Tailings Piles.	12/31/88	***Completed in 1988.***
S Approximately 1,800 cubic yards of clay pad and associated drainage piping shall be moved to disposal on top of the Tailings Piles or other approved location in accordance with the Final Plans and Specifications.	12/31/88	***Completed in 1988.***
S Contaminated soils in the Heap Leach Site shall be excavated. Excavation of contaminated soils in the Barrel Storage Area shall continue until scintillometer readings are less than 30 FR/hr or until sandstone or siltstone bedrock is encountered.	12/31/88	***Completed in 1988.*** Excavation continued down to bedrock.
S Scintillometer surveys and soil assays for radionuclides and heavy metals shall be conducted after excavation is completed. If bedrock is encountered, soil sampling is not necessary.	As required	***Completed in 1988.*** Scintillometer readings were taken. Soil samples were not collected as excavation continued down to bedrock.

Table 4.6.3-1 Mill Areas		
RAP Requirements	**Required Date of Completion**	**Site Status 10/14/99** ***Remedial Actions Completed by 10/14/99***
S Runoff controls shall be in place during remedial activities.	During excavation	Not discussed in documents reviewed for this Five-Year Review.
S If monitoring of the cover and vegetation performance, after completion of remedial activities but prior to closure of the Uravan Facility demonstrates that performance requirements as stated in the Quality Plan have not been met, Umetco shall implement additional State-approved remedial activities to achieve required performance.	As required	***Not required to-date by the State***.
5. The following remedial activities shall be conducted in the Bone Yard: **S** Contaminated materials shall be disposed on the Tailings Piles. Materials found to be uncontaminated may be disposed on the Tailings Piles or elsewhere in accordance with applicable standards.	December 31, 1988	***Completed in 1988.***

Table 4.6.3-1 Mill Areas		
RAP Requirements	**Required Date of Completion**	**Site Status 10/14/99** ***Remedial Actions Completed by 10/14/99***
S Ancillary contaminated materials shall be removed and disposed of by sale, transferred to other UCC/Umetco facilities, transferred to an appropriate off-site solid waste site, or disposed in the Tailings Piles, Burbank Quarry, or in a disposal site in the Elk Claim Area.	December 31, 1988	***Completed in 1988.***
S Contaminated soils in the Bone Yard shall be excavated. Excavation of contaminated soils in the Bone Yard shall continue until scintillometer readings are less than 30 FR/hr or until sandstone or siltstone bedrock is encountered. Materials shall be excavated, placed, and disposed on the Tailing Piles.	December 31, 1988	***Completed in 1988.*** Excavation completed down to underlying bedrock.
S Scintillometer surveys and soil assays for radionuclides and heavy metals shall be conducted after excavation is completed. If bedrock is encountered, soil sampling is not necessary.	December 31, 1988	***Completed in 1988***. Soil samples were not collected as excavation was completed down to bedrock.

Table 4.6.3-1 Mill Areas		
RAP Requirements	**Required Date of Completion**	**Site Status 10/14/99** ***Remedial Actions Completed by 10/14/99***
S Runoff controls shall be in place during remedial activities to prevent releases of hazardous substances required performance.	During excavation	Not discussed in documents reviewed for this Five-Year Review.
S The Bone Yard shall be graded and vegetated to minimize soil erosion, except where bedrock is exposed at the surface.	Following completion of remedial activities at the Bone Yard	***Not required***. Bedrock is exposed at the surface.
S If monitoring of the cover and vegetation performance, after completion of remedial activities but prior to closure of the Uravan Facility demonstrates that performance requirements as stated in the Quality Plan have not been met, Umetco shall implement additional State-approved remedial activities.	As required	***Not required to-date by the State***

Table 4.6.3-1 Mill Areas		
RAP Requirements	**Required Date of Completion**	**Site Status 10/14/99** ***Remedial Actions Completed by 10/14/99***
6. Other Mill Areas The following remedial activities shall be conducted in the Other Mill Areas:		
S Ancillary contaminated materials including pipelines, deposits in ditches, surface contamination of roads, etc. shall be removed and disposed of by sale, transferred to other UCC/Umetco facilities, transferred to an appropriate off-site solid waste site, or disposed in the Tailings Piles, Burbank Quarry, or in a disposal site in the Elk Claim Area.	Not later than completion of mill decommissioning	***Completed in 1988.***
S Contaminated soils in the ditches and roads shall be excavated. Excavation of contaminated soils in the Bone Yard shall continue until scintillometer readings are less than 30 FR/hr or until sandstone or siltstone bedrock is encountered. Materials shall be excavated, placed, and disposed on the Tailing Piles.	Not later than completion of mill decommissioning	***Completed in 1988.***

Table 4.6.3-1 Mill Areas		
RAP Requirements	**Required Date of Completion**	**Site Status 10/14/99** ***Remedial Actions Completed by 10/14/99***
S Scintillometer surveys and soil assays for radionuclides and heavy metals shall be conducted after excavation is completed. If bedrock is encountered, soil sampling is not necessary.	Not later than completion of mill decommissioning	***Completed in 1988.***
S Runoff controls shall be in place during remedial activities to prevent releases of hazardous substances required performance.	During excavation activities to prevent releases of hazardous substances	Not discussed in documents reviewed during this Five-Year Review.
S The area shall be graded and vegetated to minimize soil erosion, except where bedrock is exposed at the surface.	Not later than completion of mill decommissioning	***Completed in 1988, where required.***
S If monitoring of the cover and vegetation performance, after completion of remedial activities but prior to closure of the Uravan Facility demonstrates that performance requirements as stated in the Quality Plan have not been met, Umetco shall implement additional State-approved remedial activities to achieve required performance.	As required	***Not required to-date by State***

Table 4.6.3-1 Mill Areas		
RAP Requirements	**Required Date of Completion**	**Site Status 10/14/99** ***Remedial Actions Completed by 10/14/99***
7. A Final Construction Report shall be submitted to the State.	Not later than ninety (90) days following completion of removal and/or excavation activities	***NOT SUBMITTED TO-DATE AS REQUIRED BY RAP.***
8. A Certification Report shall be submitted	Not later than 120 days after completion of all remediation activities at the Uravan site	***Not Required as of 10/14/99.*** All remediation activities at the Uravan site have not been completed.
9. Long-term monitoring and maintenance of the surface configuration, vegetation, and ground water shall be conducted in accordance pursuant to the Colorado Radioactive Materials License.	After closure of Uravan facility	***Ongoing.***

4.7 Town and Adjacent Areas

4.7.1 History

The Town of Uravan, Figure 2-2, occupied the valley area just northwest of Tailings Pile #1-2. Adjacent areas are the town dump, which is northwest of the town obliquely opposite to Atkinson Creek on the south side of the San Miguel River, and areas adjacent to the town which were affected primarily by windblown material, including Hieroglyphic Canyon, San Miguel River, and Atkinson Creek drainage ways. Tailings were used in localized construction activities and were also spilled from delivery pipelines running through the town area. Wind- and surface water-transported tailings were found in the town and adjacent drainages. Remnant tailings were also located under Highway 141.

4.7.2 Remedial Objectives

In the RAP, the State selected excavation and on-site disposal of contaminated materials, waste from the Town Dump, remnant tailings, streamway and drainage way deposits, and windblown materials into the Tailings Piles, the Burbank Quarry, or a disposal site in the Elk Claim Area as the remedy for the Town and Adjacent Areas. The objectives of this remedy were to remove the source of future potential contamination of surrounding soils, underlying soils, ground water, and surface water.

4.7.3 Site Status and RAP Requirements

4.7.3.1 Status December 1993 (Excerpted from EPA 1993 Five Year Review, Umetco 1997 Five Year Review, CDPHE 1999 Uravan Remedial Action Plan Status Report)

Removal of remnant tailings occurred from 1987 to 1989. Initial removal of remnant tailings under an entrance road, within the Town of Uravan, and tailings up to the right-of-way for Highway 141 was completed in December 1989. ***This activity is 100 percent complete.***

Removal of remnant tailings under Highway 141 required approval by the Colorado Department of Transportation. The RAP schedule called for initial removal to be accomplished by December 31, 1989. Removal of other contaminated soils from the Town Area continued.

In 1991, Umetco performed surveys to determine the extent of contamination in the Atkinson Creek and Hieroglyphic Canyon. The results of the Hieroglyphic Canyon survey were submitted to the State. The survey indicated that no further remedial actions were needed. The investigation of the Town Dump was completed in 1988. A plan for dump cleanup was submitted to the State in early 1991. The State commented on the plan but had not received a new proposal from Umetco.

Removal of housing structures and contaminated soils in the Town of Uravan started in 1987. The RAP required that contaminated materials be removed by December 31, 1994. The Town Area will be graded and revegetated after the soil verification studies have been completed and approved by the State.

The Town and Adjacent Area Projects were approximately 40 percent complete.

4.7.3.2 Status October 1999 (Excerpted from Umetco 1997 Five Year Review, CDPHE 1999 Uravan Remedial Action Plan Status Report)

No further work on the Remnant Tailings was needed or conducted. However, the Final Construction Report for this work has not been submitted to the State for approval, even though required by the RAP.

Streamway and drainageway deposits include sediments in the San Miguel River, Atkinson Creek, and Hieroglyphic Canyon. It was determined that sediments in the San Miguel River would not be removed. Umetco performed surveys in 1991 to determine the extent of contamination in Atkinson Creek and Hieroglyphic Canyon. Contaminated materials discovered at the mouth of Hieroglyphic Canyon were removed in 1994. Assessment of the upper reach of Hieroglyphic Canyon indicated that no significant contamination existed in the streambed and excavation of any low activity material would result in significant environmental impacts. Therefore, low-concentration contaminated sediments in Hieroglyphic Canyon were not removed. Sediments identified within 1,000 feet of the San Miguel River will be removed if they exceeded 30 microRoentgens per hour. The results of the Atkinson Creek survey have not been submitted to the State. The Final Construction Report for the work at the mouth of Hieroglyphic Canyon has not been submitted to the State, even though required by the RAP.

This activity is approximately 40 percent complete as of October 14, 1999.

Removal of housing structures and contaminated soils in the Town of Uravan started in 1987 and was completed in 1994. This activity resulted in the removal of more than 260 structures and excavation of

approximately 186,000 cubic yards of contaminated soil. The RAP required that contaminated materials be removed by December 31, 1994. The Town Area on the east side of the river was graded and revegetated after all of the soil verification studies were completed and approved by the State. ***This activity is 100 percent complete as of October 14, 1999***. However, the Final Construction Report for the Town Area has not been submitted to the State for approval, as required by the RAP. No documents were available for review during this Five-Year Review indicating that soil verification studies were completed and/or approved by the State, or that re-vegetation of the Town Area on the west side of the San Miguel River had been completed.

In 1997 and 1998, contaminated soils characterization was performed for Dispersed Deposits adjacent to Uravan, including material located along the Mill Hillside, the water storage pond adjacent to Hieroglyphic Canyon, Northeast Highway 141, and County Roads Y-11 and EE-22. All areas have been characterized and cleanup activities have commenced. The foundations of the Joe Junior Mill have been removed and most of the tailings under County Road EE-22 have been removed. ***These activities are 85 percent complete as of October 14, 1999.***

Removal of hillside concrete foundations and appurtenant structures associated with the former Vanadium Plant began in the first quarter of 1999. The concrete structures and the areas of gross contamination have been removed. However, Umetco personnel indicated that contamination investigations have not been completed on this face of Club Mesa. Umetco expects to find contaminant concentrations exceeding the cleanup levels. However, Umetco is uncertain of the ecological effect that a total cleanup of contaminant residues on the Club Mesa face would have on the San Miguel River. Umetco is concerned that rather than protecting the river, remedial activities would only cause the contaminants to become more mobile due to soil erosion, thereby contaminating the river. Once the contaminant investigations are completed and the data studied, Umetco expects to discuss cleanup options with the State.

Characterization of materials in the Town Dumps was completed in 1988. Mill-related contamination was identified in the Town Dumps during this investigation. Umetco estimated that approximately 120,000 cubic yards of material would require excavation. Cleanup of the Town Dumps were performed in 1998. Approximately 250,000 cubic yards of material were taken to new B-Plant Area Repository for disposal. Pending State approval of Umetco's Confirmation Investigation Report, final grading and reclamation of the area will be initiated. ***This activity is 99 percent complete as of October 14, 1999***.

Windblown materials were removed from areas to the southeast and northeast of the Boneyard, northeast of Tailings Pile #1-2, and fringe areas of Club Mesa between 1993 and 1999. Additional characterization of windblown materials was completed in 1997. Remedial activities for this material are being developed in accordance with the RAP.

Table 4.7.3-1 summarizes the major requirements for remedial activities at the Town and Adjacent Area specified in Section 4.7.2 of the RAP, required completion dates as specified in Section 4.7.4 of the RAP, and status as of October 14, 1999.

4.7.4 Summary of Site Visit Observations and Findings

The site visits of October 13 and 14, 1999 visually found the Town and Adjacent Areas to be mostly remediated. All but two of the buildings in the Town of Uravan had been removed. The two buildings remaining, the Boarding House and Town Civic Hall, have been designated as Historical Buildings and will remain at the site. Approximately eight (8) feet of contaminated soil had been excavated and removed from a large part of the town area. No visible signs of remaining contamination, e.g., buildings, drums, equipment, discolored soil, tailings, etc., were observed in this area during the visit. Grading and re-vegetation of the town area appeared to have been completed, and small amounts of healthy-looking vegetation have been re-established in this area.

The Town Dumps were excavated down to bedrock. Small areas of erosion were evident in the Town Dump Areas. However, these erosional areas are expected to be addressed through final regrading and reclamation of the area.

4.7.5 Photographs

Photos 4.7-1 through 4.7-3 is a panorama view of the San Miguel River Valley showing the Town of Uravan as of July 1989. Photos 4.7-4 through 4.7-8 is a panorama view of the San Miguel River Valley showing the Town of Uravan as of October 1999. Photo 4.7-9 shows the hillside below B-Plant with various concrete structures, as of July 1989, while Photo 4.7-10 shows the hillside without concrete structures in October 1999.

Recommendations:

1. Contamination investigations of the Mill Hillside should be completed as soon as possible.

2. Discussions with the State should be conducted as soon as possible after the investigations are complete to determine the final cleanup plan for this area.

3. The initial cleanup criteria of the hillside area was based on visual determination of contaminant and structure removal, followed by a scintillometer survey of the area. A risk assessment should be conducted for a scenario of leaving the contaminants in place without further remediation to determine the potential long-term impacts to humans and the environment. These risks can then be compared to the safety risks to workers removing site contaminants from a very steep area and to the potential environmental risk of making remaining contamination more susceptible to erosion caused by precipitation and wind.

4. The Final Construction Reports for the Town Areas, Hieroglyphic Canyon, and Remnant Tailings should be submitted to the State for approval as soon as possible.

5. The investigation results of the Atkinson Creek stream bed should be provided to the State as soon as possible.

Table 4.7.3-1 Town and Adjacent Areas		
RAP Requirements	**Required Date of Completion**	**Site Status 10/14/99**
		Remedial Actions Completed as of 10/14/99
1. The following remedial activities shall be conducted in the Town and Dispersed Deposits:		
S Uncontaminated equipment, structures, and waste materials from the Town of Uravan may be disposed of by sale, transferred to other UCC/Umetco facilities, transferred to an appropriate off-site solid waste site, or disposed in the Tailings Pile, the Burbank Quarry or a disposal site in the Elk Claim Area.	12/31/94	***Completed in 1994.***
S Contaminated equipment, structures and waste materials from the Town of Uravan, contaminated soils underlying the mill areas, and ancillary contaminated materials shall be disposed of in the Tailings Pile, the Burbank Quarry, or a disposal site in the Elk Claim Area.	12/31/94	***Completed in 1994.***

Table 4.7.3-1 Town and Adjacent Areas		
RAP Requirements	**Required Date of Completion**	**Site Status 10/14/99**
S Excavation of contaminated soils in the Town of Uravan, in adjacent areas along the San Miguel Valley, and in such other adjacent locations outside the waste repositories as specified by the State, shall continue until scintillometer readings are less than 30 FR/hr or until sandstone or siltstone bedrock is encountered.	12/31/94	***Completed in 1994.*** Excavation removed materials down to underlying bedrock.
S Scintillometer surveys and soil assays for radionuclides and heavy metals shall be conducted after excavation is completed. If bedrock is encountered, soil sampling is not necessary.	12/31/94	***Completed in 1994.*** Scintillometer surveys conducted. Soil samples were not required as excavation removed materials down to underlying bedrock.
S Runoff controls shall be in place during remedial activities to prevent releases of hazardous substances.	During remedial activities	Not discussed in documents reviewed during this Five-Year Review.
S The Town and Dispersed Deposit Areas shall be graded and vegetated to minimize soil erosion, except where bedrock is exposed at the surface.	12/31/94	***The Town was graded and revegetated in 1994.*** It was not required in other areas as excavation was undertaken to underlying bedrock.

Table 4.7.3-1 Town and Adjacent Areas		
RAP Requirements	**Required Date of Completion**	**Site Status 10/14/99**
S If monitoring of the cover and vegetation performance, after completion of remedial activities but prior to closure of the Uravan Facility demonstrates that performance requirements as stated in the Quality Plan have not been met, Umetco shall implement additional State-approved remedial activities to achieve required performance.	As required	***Not required to-date by State of Colorado.***

Table 4.7.3-1 Town and Adjacent Areas		
RAP Requirements	**Required Date of Completion**	**Site Status 10/14/99**
		Remedial Actions 99% Complete as of 10/14/99
2. The following activities shall be conducted in the Town Dump:		
S The Town Dump shall be investigated to ascertain whether hazardous substances are present.	Initiated by 6/30/87 Remedial action based on State-approved schedule	***Completed .*** Investigations were conducted in 1988.
S Investigations shall include test pits and/or borings, and laboratory tests.		***Completed.*** Investigations were conducted in1988.
S The investigation program shall be submitted to the State for approval.		***Completed.*** Investigations were conducted in 1988.
S If hazardous materials are present, UCC/Umetco shall develop an action plan for removal and disposal of the materials and submit a plan to the State for review and approval prior to implementation.		***Completed.*** Remedial action plan developed and submitted to State in 1991.
S Remedial activities for removal and disposal of Town Dump contaminated material shall conform to federal and State rules and regulations.		***99% Completed by 10/14/99.*** Town dump excavated in 1998 and 1999.

Table 4.7.3-1 Town and Adjacent Areas		
RAP Requirements	**Required Date of Completion**	**Site Status 10/14/99**
		Remedial Actions Completed by 10/14/99
3. The following remedial activities shall be conducted in the Remnant Tailings Areas located in and around the Town of Uravan including material (1) located under Colorado Highway 141; (2) located beneath the entrance to B-Block; (3) used for construction or backfill in the Town of Uravan:		
S Tailings deposits and associated contaminated soils shall be removed from under Colorado Highway 141 at such time the subsurface may be exposed for any reason. The materials shall be placed in Tailings Piles #1, 2, and/or 3. UCC/Umetco has no responsibility to expose the subsurface or replace Colorado Highway 141. UCC/Umetco shall have no responsibility for removing these materials after closure of the Tailings Piles.	12/31/89	***Ongoing.*** Working with Colorado Department of Transportation for any work on Highway 141. ***Completed***. Remnant tailings up to the Highway 141 right-of-way were removed as required by 12/31/89.
S Tailings and associated contaminated soils shall be removed from beneath the entrance road to B-Block and shall be placed on the Tailings Piles.	12/31/89	***Completed by 12/31/89.***

Table 4.7.3-1 Town and Adjacent Areas		
RAP Requirements	**Required Date of Completion**	**Site Status 10/14/99**
S Discrete deposits of radioactive materials identified in the Town by previous surveys and during cleanup activities shall be removed, placed, and disposed on the Tailings Piles.	12/31/89	***Completed by 12/31/89.***
S Excavation of contaminated soils in the Remnant Tailings Areas shall continue until scintillometer readings are less than 30 FR/hr or until sandstone or siltstone bedrock is encountered. Materials shall be excavated, placed, and disposed on the Tailing Piles.	12/31/89	***Completed by 12/31/89.***
S Scintillometer surveys and soil assays for radionuclides and heavy metals shall be conducted after excavation is completed. If bedrock is encountered, soil sampling is not necessary.	12/31/89	***Completed. By 12/31/89*** Scintillometer surveys were conducted. Soil samples were not required as excavation removed materials down to underlying bedrock.
S Runoff controls shall be in place during remedial activities to prevent releases of hazardous substances.	At all times during remediation	Not discussed in documents reviewed during this Five-Year Review.

Table 4.7.3-1 Town and Adjacent Areas		
RAP Requirements	**Required Date of Completion**	**Site Status 10/14/99**
S If monitoring of the cover and vegetation performance, after completion of remedial activities but prior to closure of the Uravan Facility demonstrates that performance requirements as stated in the Quality Plan have not been met, Umetco shall implement additional State-approved remedial activities to achieve required performance.	As required	***Not required to-date by State of Colorado.***
4. The following remedial activities shall be conducted for the Windblown Material :		***Remedial Actions Not Completed as of 10/14/99***
S General windblown material in the Club Mesa Area shall not be removed or plowed due to the presence of a thin soils cover. To the extent achievable, contaminated deposits shall be removed if scintillometer readings are more than 30 FR/hr.	Not specified in RAP	***Remedial activities are being developed***.

Table 4.7.3-1 Town and Adjacent Areas		
RAP Requirements	**Required Date of Completion**	**Site Status 10/14/99**
S Excavation of Windblown Materials and contaminated soils shall continue until scintillometer readings are less than 30 FR/hr or until sandstone or siltstone bedrock is encountered. Materials shall be excavated, placed, and disposed on the Tailing Piles.	Not specified in RAP	***Remedial activities are being developed***.
S Scintillometer surveys and soil assays for radionuclides and heavy metals shall be conducted after excavation is completed. If bedrock is encountered, soil sampling is not necessary.	Not specified in RAP	***Remedial activities are being developed***.
S Runoff controls shall be in place during remedial activities to prevent releases of hazardous substances required performance.	Not specified in RAP	***Remedial activities are being developed***.

Table 4.7.3-1 Town and Adjacent Areas		
RAP Requirements	**Required Date of Completion**	**Site Status 10/14/99**
S Sediment traps shall be constructed in the immediate area of the Tailings Piles and Spray Area and shall be designed to collect sediment carried into the intermittently flowing drainages.	12/31/87	***Completed.***
S Sediment traps shall be inspected at least once per year and cleaned in accordance with schedule given in the final plans and specifications.	Annually	***Ongoing.***
S If monitoring of the cover and vegetation performance, after completion of remedial activities but prior to closure of the Uravan Facility demonstrates that performance. requirements as stated in the Quality Plan have not been met, Umetco shall implement additional State-approved remedial activities to achieve required performance.	As required	***Not required to-date by the State***.

Table 4.7.3-1 Town and Adjacent Areas		
RAP Requirements	**Required Date of Completion**	**Site Status 10/14/99**
		Remedial Activities 40% Completed as of 10/14/99.
5. The following remedial activities shall be conducted in the Stream way and Drainage way Deposits:		
S Sediments in the San Miguel River, other than those removed when the River Ponds were excavated, shall not be removed.	Not applicable	Sediments in the San Miguel River, other than in River Ponds, have not been removed by Umetco.
S Concentrated contaminated sediments found in the Atkinson Creek stream bed within 1,000 feet of the San Miguel River with scintillometer readings greater than 30 FR/hr shall be removed, placed, and disposed in the Tailings Piles.	Not specified in RAP	***Investigation results have not been submitted to State as of 10/14/99.*** Sediments with scintillometer readings greater than 30 FR/hr have not been found in the Atkinson Creek streambed within 1,000 feet of the San Miguel River.
S Excavation of contaminated soils in the Stream way and Drainage way Deposits shall continue until scintillometer readings are less than 30 FR/hr or until sandstone or siltstone bedrock is encountered. Materials shall be excavated, placed, and disposed on the Tailing Piles.	Not specified in RAP	***Completed by 12/31/94 for mouth of Hieroglyphic Canyon. Not required for other areas.***

Table 4.7.3-1 Town and Adjacent Areas		
RAP Requirements	**Required Date of Completion**	**Site Status 10/14/99**
S Scintillometer surveys and soil assays for radionuclides and heavy metals shall be conducted after excavation is completed. If bedrock is encountered, soil sampling is not necessary.	Not specified in RAP	***Completed by 12/31/94 for mouth of Hieroglyphic Canyon. Not required for other areas.***
S Runoff controls shall be in place during remedial activities to prevent releases of hazardous substances required performance.	During excavation	Not discussed in documents reviewed during this Five-Year Review.
S The excavated areas shall be graded and vegetated to minimize soil erosion, except where bedrock is exposed at the surface.	Following completion of remedial activities	***Completed by 12/31/94 for mouth of Hieroglyphic Canyon. Not required for other areas.***
S If monitoring of the cover and vegetation performance, after completion of remedial activities but prior to closure of the Uravan Facility demonstrates that performance requirements as stated in the Quality Plan have not been met, Umetco shall implement additional State-approved remedial activities to achieve required performance.	As required	***Not required to-date by the State.***

Table 4.7.3-1 Town and Adjacent Areas		
RAP Requirements	**Required Date of Completion**	**Site Status 10/14/99**
6. The following remedial activities shall be conducted in Hieroglyphic Canyon:		
S Concentrated contaminated material in the Hieroglyphic Canyon streambed with scintillometer readings greater than 30 FR/hr may be removed, after considering the technical feasibility, cost effectiveness, environmental impact, and threat to the public health.	Not later than 12/31/94	***Completed.*** Upper reaches of Hieroglyphic Canyon not impacted. Contaminated materials at confluence with San Miguel River removed as required by 12/31/94.
S Excavation of contaminated soils in Hieroglyphic Canyon shall continue until scintillometer readings are less than 30 FR/hr or until sandstone or siltstone bedrock is encountered. Materials shall be excavated, placed, and disposed on the Tailing Piles.	Not later than 12/31/94	***Completed by 12/31/94.***
S Scintillometer surveys and soil assays for radionuclides and heavy metals shall be conducted after excavation is completed. If bedrock is encountered, soil sampling is not necessary	Not later than 12/31/94	***Completed by 12/31/94.***
S Runoff controls shall be in place during remedial activities to prevent releases of hazardous substances required performance.	During excavation activities	Not discussed in documents reviewed during this Five-Year Review.

Table 4.7.3-1 Town and Adjacent Areas		
RAP Requirements	**Required Date of Completion**	**Site Status 10/14/99**
S The area shall be graded and vegetated to minimize soil erosion, except where bedrock is exposed at the surface.	Not later than 12/31/94	***Completed by 12/31/94, where required.***
S If monitoring of the cover and vegetation performance, after completion of remedial activities but prior to closure of the Uravan Facility demonstrates that performance requirements as stated in the Quality Plan have not been met, Umetco shall implement additional State-approved remedial activities to achieve required performance.	As required	***Not required to-date by the State.***
7. A Final Construction Report shall be submitted to the State of Colorado.	Not later than ninety (90) days following completion of removal and/or excavation activities	***FINAL CONSTRUCTION REPORTS FOR THE TOWN AREAS, REMNANT TAILINGS, AND HIEROGLYPHIC CANYON HAVE NOT BEEN SUBMITTED TO THE STATE AS REQUIRED BY THE RAP.*** Final Construction Reports for the other areas are not required as remediation activities in these areas have not been completed as of 10/15/99.

Table 4.7.3-1 Town and Adjacent Areas		
RAP Requirements	**Required Date of Completion**	**Site Status 10/14/99**
8. A Certification Report shall be submitted to the State.	Not later than 120 days after completion of all remediation activities at the Uravan site	***Not Required as of 10/14/99.*** All remediation activities at the Uravan site have not been completed.
9. Long-term monitoring and maintenance of the surface configuration, vegetation, and ground water shall be conducted pursuant to the Colorado Radioactive Materials License.	After closure of Uravan facility	***Ongoing.***

4.8 Burbank Quarry

4.8.1 History

The Burbank Quarry, Figures 2-2 and 2-3, was intended to be the source of riprap for remedial activities. Random fill and clays may be mined from the pit for use in remedial construction. The quarry shall also be the raffinate crystal repository and may serve as the repository for other wastes as approved by the State.

4.8.2 Remedial Objectives

The RAP required the placement of raffinate crystals removed from the Atkinson Creek Crystal Disposal Area, the Club Ranch Evaporation Ponds, and the Club Mesa Spray Area in the below-grade Burbank Quarry. Crystals were to be disposed in clay-lined cells that would be capped by earthen materials and riprapped for erosion protection. Design of the cover was to include consideration of the probable maximum precipitation events and maximum credible earthquakes.

4.8.3 Site Status and RAP Requirements

4.8.3.1 Status December 1993 (Excerpted from EPA 1993 Five Year Review, Umetco 1997 Five Year Review, CDPHE 1999 Uravan Remedial Action Plan Status Report)

The RAP schedule called for initiation of crystal placement by September 30, 1989, and placement of the final reclamation cover not later than December 31, 2000. A small area could remain open to accept crystal residue from the lined Club Ranch Evaporation Ponds until one year following disposal of the liners and residues from the Ponds.

Placement of crystals was initiated in late September, 1989. Diversion ditches for the repository were constructed in mid-1989 and were required to be in place by December 31, 1989. Revised plans and specifications were accepted by the State to allow for construction of a seepage interception tunnel to be placed into the bedrock adjacent to the repository. The revised plans also contained provisions for placing a clay liner up the interior sideslopes of the repository.

Slightly more than 700,000 cubic yards of material has been placed in the repository from the Club Ranch Ponds and Club Mesa Areas. Approximately 200 feet of the final cover, including rock cover, has been placed over the repository.

4.8.3.2 Status October 1999 (Excerpted from Umetco 1997 Five Year Review, CDPHE 1999 Uravan Remedial Action Plan Status Report)

Other than placement of raffinate crystals removed from Atkinson Creek and the unlined Club Ranch Ponds, no additional materials were added to the Burbank Quarry since 1993. Although the original RAP permitted part of the Burbank Quarry to remain open until December 31, 2001 to receive raffinate crystals and liners from the lined Club Ranch Evaporation Ponds, the RAP was amended to permit the placement of these materials into the new B-Plant Repository rather than the Burbank Quarry Repository.

In 1996, access to the upper Burbank Quarry Repository was granted to the U.S. Department of Energy (DOE) for use as a disposal area for Naturita-UMTRA Title I materials. Placement of these UMTRA materials into the upper Burbank Quarry Repository was completed in late 1998. In mid-1998, a surface water diversion channel was installed along the west side of the upper and lower Burbank Quarry Repository. The placement of the entire cover, including rock armor, for the lower and upper Burbank Quarry Repository was completed in early January 1999, just after the December 31, 1998 RAP-imposed deadline. This delay was reportedly due to bad weather at the site and to delays resulting from DOE contractor work on the upper Burbank Quarry Repository. Following completion of work, the upper Burbank Quarry Repository was deeded to the DOE and was removed from the boundaries of the Uravan Superfund Site.

In late 1995, a seep ponding below the lower Burbank Raffinate Repository was identified. These liquids were collected in a containment pond and transferred to the lined Club Ranch Evaporation Ponds on an as-needed basis through late-1998, when the containment pond was removed and a temporary seepage control system installed. The temporary seepage control system traverses the slope of the repository and consists of a gravel filter blanket and geotextile fabric covered by 1.5 feet of clay material. The system drains to a fluid collection sump at the eastern corner of the repository. No further seepage liquids have collected in the temporary seepage control system since its installation. This system is currently being monitored on a weekly basis.

Although required by the RAP, Umetco has not submitted a Final Construction Report to the State for approval.

Construction of this project is 100 percent complete.

Table 4.8.3-1 summarizes the major requirements for remedial activities at the Burbank Quarry Repository specified in Section 4.8.2 of the RAP, required completion dates as specified in Section 4.8.4 of the RAP, and status as of October 14, 1999.

4.8.4 Summary of Site Visit Observations and Findings

The site visits of October 13 and 14, 1999 visually found the Burbank Quarry to be totally capped and covered. Vegetation has not been re-established on the top cover of the Burbank Quarry, but has been re-established on the outer boundaries of the quarry. The covers of the upper and lower sections of the Burbank Quarry are contiguous, separated only by a fence and a surface water diversion channel. The surface water diversion channel to divert surface water draining off the abutting mesa was observed on the west side of the cover.

4.8.5 Photographs

Photo 4.8-1 shows the Burbank Quarry Repository in May 1989. Photos 4.8-2 and 4.8-3 show the Burbank Quarry Repository as of October 1999. Photo 4.8-2 shows both the Umetco and DOE's parts of the Repository and the western diversion ditch. The diversion ditch visible in the middle of the photo delineates the Umetco and DOE parts of the facility. Photo 4.8-3 shows only the DOE part of the Repository and the western diversion ditch .

Recommendations:

1. The Final Construction Report should be submitted to the State for approval as soon as possible.

Table 4.8.3-1 Burbank Quarry		
RAP Requirements	**Required Date of Completion**	**Site Status 10/14/99** ***Remedial Actions 100 % Completed as of 10/14/99***
1. The following remedial activities shall be conducted in the Burbank Quarry:		
S The existing quarry shall be mined to obtain borrow material and riprap for use in the remedial action program.	Consistent with need for material and shall not conflict with schedule for placement of crystals	***Completed by 1/31/99.***
S The bottom of the quarry underlying the crystal repository area shall be covered by at least one (1) foot of compacted in-situ or imported clay.	At all times during placement of raffinate crystals	***Completed 12/31/93.***
S The raffinate crystals removed from the Atkinson Creek Disposal Area, Club Ranch Ponds, Club Mesa Area, and any other crystal disposal areas shall be placed, compacted, and disposed in the quarry "cells" in accordance with Approved Final Plans and Specifications.	12/31/2000 except that an area to contain crystal residue from the Club Ranch Lined Evaporation Ponds may remain open until one year following disposal of the liner and residue from the evaporation ponds	***Completed by 12/31/93.*** Note: RAP modified to permit disposal of the liner and residue from the Club Mesa Lined Evaporation Ponds into the B-Plant Repository.

Table 4.8.3-1 Burbank Quarry		
RAP Requirements	**Required Date of Completion**	**Site Status 10/14/99** ***Remedial Actions 100 % Completed as of 10/14/99***
S The deposited crystals shall be contained in the quarry without modification of the side slope. The final exterior slope of the quarry shall be no steeper than 3(H):1(V).	At all times during placement of crystals	***Completed by 12/31/93.***
S The exposed surfaces shall be reclaimed with a cover 1.83 meters thick, consisting of 0.33 meters of compacted clay, 0.84 meters of random fill, and 0.66 meters of riprap, or as determined during final design and presented in the Final Plans and Specifications.	12/31/2000	***Completed by1/31/99.***
S Areas on the quarry walls which may emit water shall be evaluated and appropriate measures to prevent dissolving of crystals or disruption of the repository shall be implemented by UCC/Umetco upon approval by the State.	Not specified in RAP	***Completed***. A seepage interception tunnel was placed into the bedrock adjacent to the repository. A clay liner was also placed up the interior sides of the repository.
S Runoff control structures shall be constructed to divert surface water away from the quarry.	12/31/89	***Completed by 12/31/89.***
S A drainage control system shall be constructed prior to the initiation of storage activities to prevent	12/31/89	***Completed by 12/31/89.***

Table 4.8.3-1 Burbank Quarry		
RAP Requirements	**Required Date of Completion**	**Site Status 10/14/99** ***Remedial Actions 100 % Completed as of 10/14/99***
S If monitoring of the cover and vegetation performance, after completion of remedial activities but prior to closure of the Uravan Facility demonstrates that performance. requirements as stated in the Quality Plan have not been met, Umetco shall implement additional State-approved remedial activities to achieve required performance.	As required	***Not required to-date by the State.***
S If monitoring of the integrity of the cells prior to closure demonstrates that the performance requirements of the RAP are not met, UCC/Umetco shall l propose, for review and approval by the State, and implement additional remedial actions to achieve required performance.	As required	***Not required to-date by the State.***
2. A Final Construction Report shall be submitted to the State.	Not later than ninety (90) days following completion of removal and/or excavation activities	***NOT SUBMITTED TO-DATE AS REQUIRED BY RAP.***

Table 4.8.3-1 Burbank Quarry		
RAP Requirements	**Required Date of Completion**	**Site Status 10/14/99** ***Remedial Actions 100 % Completed as of 10/14/99***
3. A Certification Report shall be submitted to the State.	Not later than 120 days after completion of all remediation activities at the Uravan site	***Not Required as of 10/14/99.*** All remediation activities at the Uravan site have not been completed.
4. Long-term monitoring and maintenance of the surface configuration, vegetation, and ground water shall be conducted pursuant to the Colorado Radioactive Materials License.	After closure of Uravan facility	***Ongoing.***

4.9 Borrow Areas on Club Mesa

4.9.1 History

The Borrow Areas on Club Mesa are not contaminated. They were intended to be used as sources of clayey soils and random backfill to be used during remedial activities. Figures 2-2 and 2-3 show the location of the Club Mesa Borrow Area. Figure 2-3 also shows the location of the Valley Borrow Area.

4.9.2 Remedial Objectives

Remediation activities at these areas will not be conducted. They are intended to be used as sources of clayey soils and random backfill to be used during remedial activities.

4.9.3 Site Status and RAP Requirements

4.9.3.1 Status December 1993

Not addressed by the previous Five-Year review.

4.9.3.2 Status October 1999 (Excerpted from CDPHE 1999 Uravan Remedial Action Plan Status Report)

Two borrow areas exist for the Uravan site. One site is located on Club Mesa above the Burbank Repository. The other site is located in the valley on the east side of Highway 141 across from the Club Ranch Ponds. The borrow area on Club Mesa was expanded in 1992 and 1997. Both borrow areas are operated in compliance with State Mined Land Reclamation Permits. Bonding for borrow area reclamation is also held by the State Mined Land Reclamation Division.

Table 4.9.3-1 summarizes the major requirements for remedial activities at the River Ponds Area specified in Section 4.9.2 of the RAP, required completion dates as specified in Section 4.9.4 of the RAP, and status as of October 14, 1999.

4.9.4 Summary of Site Visit Observations and Findings

During the site visits of October 13 and 14, 1999 the Borrow Area on top of Club Mesa visually appeared to be operated in accordance with its permit, although no actual work in this area was ongoing during the site visit. The Borrow Area located on the east side of Highway 141 was not observed during the site visit.

4.9.5 Photographs

Photo 4.9-1 through 4.9-3 show one of the Club Mesa Borrow Areas as of October 1999. It should be noted that the mine adit visible in Photo 4.9-3, although located in the general area of the Borrow Area and the Burbank Quarry Repository, is not owned, operated, or under the control of Umetco.

Recommendations:

1. None noted

Table 4.9.3-1 Borrow Areas on Club Mesa		
RAP Requirements	**Required Date of Completion**	**Site Status 10/14/99**
		Operations at Borrow Areas Ongoing as of 10/14/99.
1. The following work activities shall be conducted in the Borrow Areas:		
S Borrow materials shall be excavated on an as-needed basis during the implementation of the RAP.	At the completion of remedial actions	***Ongoing.***
S Construction and reclamation shall be conducted in accordance with a plan prepared and submitted by UCC/Umetco and approved by the State Mined Land Reclamation Division.	At the completion of remedial actions	***Ongoing.***
2. Long-term monitoring and maintenance of the surface configuration, vegetation, and ground water shall be conducted pursuant to the Colorado Radioactive Materials License.	After closure of the Uravan Facility	***Ongoing.***

5.0 DESCRIPTIONS OF REMEDIAL ACTIONS - LIQUIDS

5.1 Hillside Seepage and Tailings Liquids

5.1.1 Hillside Seepage

5.1.1.1 History

Seepage has been occurring intermittently along approximately 4600 linear feet of the Club Mesa rim. Seepage occurs near the contact between the Summerville and Salt Wash Formations and exits the valley walls of Hieroglyphic Canyon and the San Miguel River above the A-Plant Area. Some of the seepage is presently collected in ditches and along roadways and conveyed to the Club Ranch Ponds. At the beginning of remedial action at this site, UCC/Umetco estimated the seepage rate to be approximately 30 gallons per minute. The volume of hillside seepage was expected to diminish with time. The hillside seepage is composed of geochemically-modified tailings solutions from the Tailings Pile and the Club Mesa Spray Area. The level of total dissolved solids and ionic concentrations are much lower than that of the parent solutions.

5.1.1.2 Remedial Objectives

Remediation activities will minimize the potential for discharge of contaminated surface waters from the site into the San Miguel River, in violation of the site's surface water discharge prohibition.

5.1.1.3 Site Status and RAP Requirements

5.1.1.3.1 Status December 1993 (Excerpted from EPA 1993 Five Year Review, Umetco 1997 Five Year Review, CDPHE 1999 Uravan Remedial Action Plan Status Report)

Improvements to the hillside seepage collection system were initiated and completed in 1988. Approximately 1500 linear feet of drainpipe and 3200 feet of drainage ditch were constructed to intercept seepage. Maintenance and repair work were performed on some of the ditches in 1992.

Two evaporation ponds, Club Ranch Evaporation Ponds #7 and #8, were constructed to handle the contaminated liquids intercepted by this project. These ponds were completed in May 1988. One pond

developed liner problems and was patched. A vent system was also placed under the liners to prevent the formation of gas bubbles under the liners. The liner and vent work was completed in mid-December 1990.

Hillside seepage rates from the canyon walls below the tailings piles and upper mills were calculated to range from 1.4 to 3.8 gallons per minute. However, examination of field data sheets for 1991 indicated that the shotcrete lining of the collection ditches was deteriorating and flows were being diverted under the shotcrete, thereby resulting in an under-reporting of seepage rates. Flow rates in 1992, after the collection ditch repairs were completed, were estimated at approximately 5.9 gallons per minute. The 1992 report indicated that the seepage continued to be high in total dissolved solids and ions. It was noted that most of the seepage collects as icing on the canyon walls in the winter and little data should be expected during this period.

5.1.1.3.2 Status October 1999 (Excerpted from Umetco 1997 Five Year Review, CDPHE 1999 Uravan Remedial Action Plan Status Report)

The Hillside Seepage Monitoring and Collection System, Figure 5.1.1-1 consists of four segments of shotcrete-lined ditches which lead to three small diversion ponds located on the upslope side of the B-Plant Road. The RAP required these ditches to be lined with high-density polyethylene (HDPE), but a field approval by the State permitted shotcrete to be used as the ditch liner. The diversion ponds are referred to as the Upper Pond, Middle Pond, and Lower Pond. The upper diversion pond collects seepage and runoff from the hillside above the top part of the B-Plant Road. The middle diversion pond collects seepage and runoff above the center part of the B-Plant Road. The lower diversion pond collects seepage and runoff from the hillside above the lower part of the B-Plant Road and the hillside seepage and runoff above County Road EE-22 leading up to Hieroglyphic Canyon. These three diversion ponds divert seepage and runoff to the new lined Runoff Collection Pond RC-4. In addition, a lower collection system is located near the base of the Entrada formation that collects seepage exiting Club Mesa below the hillside ditch system. The lower collection system consists of a series of shallow subsurface drains that gravity feed collected liquids to sumps. The liquids are then pumped to the lined Club Ranch Evaporation Ponds.

Since its installation in 1988, the system has intercepted and collected more than 38 million gallons of hillside seepage. Liquids continue to be transferred to the lined Club Ranch Evaporation Ponds for evaporation. Evaluation of the 1998 flow measurements indicates a decreasing trend in flow rates. Average flow rates decreased from approximately 5 gallons per minute in 1994 to approximately 3 gallons per minute in 1998, compared to an estimated average rate of 30 gallons per minute in 1988. Umetco

attributes the decreased flow rate to cessation of the spray evaporation system on Club Mesa, discontinued mill use, dewatering of the tailings piles, and reduction in perched zone at the base of the Salt Wash Mesa.

Evaluation of the water quality data shows some variation in the chemistry of the hillside seepage between 1994 and 1998, although it remains high in total dissolved solids (TDS), magnesium, and sulfate. Umetco attributes the variation to natural fluctuations in precipitation, infiltration, and runoff.

During mill decommissioning, approximately 600 linear feet of the collection pipes were removed in order to remove building foundations and to excavate contaminated soil.

The only remaining part of the project is to remove the pipes and ditches when they are no longer needed and to reclaim the disturbed areas.

A Final Construction Report for the Hillside Collection System was submitted to the State in April 1989.

The project is 95 percent complete as of October 14, 1999.

Table 5.1.1.3-1 summarizes the major requirements for remedial activities at the Hillside Seepage specified in Section 5.1.1.2 of the RAP, required completion dates as specified in Section 5.1.1.4 of the RAP, and status as of October 14, 1999.

5.1.1.4 Summary of Site Visit Observations and Findings

During the site visits of October 13 and 14, 1999, the Hillside Seepage Collection System visually appeared to be operating as intended. Small seeps were observed at the base of the hill adjacent to County Road EE-22. The seeps were collected in the shotcrete-lined ditch and directed to the Lower Pond at the base of Club Mesa. From there, the liquids were transferred to the lined Runoff Collection Pond RC-4 and then to the lined Club Ranch Evaporation Ponds. Seeps were also observed to be collected in the shotcrete lined ditches along the B-Plant Road below Tailings Piles #1-2, #3, and the B-Plant Repository. Some of this seepage eventually was collected in the Middle Pond which drained to RC-4, and then to the lined Club Ranch Ponds. Seepage collected in the ditch below the Middle Pond was directed to the Lower Pond and eventually to the lined Club Ranch Evaporation Ponds. Umetco had just completed maintenance on the shotcrete-lined ditches a few weeks before this Five Year Review site visit.

Areas with cracks or other deterioration were relined with concrete. Minor maintenance on these shotcrete ditches had also been initiated during other years since the 1993 Five-Year Review.

5.1.1.5 Photographs

Photos 5.1.1.5-1 and 5.1.1.5-2 show the Hillside Seepage Collection System in place along County Road EE-22 as of October 1999. Seepage is visible in these photographs. Photo 5.1.1.5-3 shows the Hillside Seepage Collection System in place along County Road EE-22 leading into the Lower Collection Pond as of October 1999. Photo 5.1.1.5-4 shows the Lower Collection Pond as of October 1999. Photo 5.1.1.5-5 shows the Middle Collection Pond located along the B-Plant Road, as of October 1999. Photo 5.1.1.5-6 shows lined Runoff Collection Pond RC-4 as of October 1999.

Recommendations:

1. The field approval that permitted the use of shotcrete rather than HDPE to line the ditches should be documented as an approved amendment to the RAP as soon as possible.

Table 5.1.1.3-1 Hillside Seepage		
RAP Requirements	**Required Date of Completion**	**Site Status 10/14/99**
		95% Complete as of 10/14/99.
1. The following work activities shall be conducted for the Hillside Seepage:		
S Improvements shall be made to the existing collection system and new collection ditches shall be constructed so as to optimize the containment of liquids. All existing and new collection ditches and ponds shall be lined with HDPE lining to enhance seepage collection	12/31/88	***Not completed in the manner specified in the RAP.*** Ditches were lined with shotcrete rather than HDPE, based on field approval by CDPHE.
S A collection system shall be installed near the base of the Entrada Formation and shall be designed and operated to collect both surface flow and interflow through the hillside colluvium. This collection system shall consist of at least a four-inch perforated polyvinyl chloride (PVC) pipe embedded in a gravel-filled trench. The bottom of the trench shall be lined with a relatively impervious material to promote drainage into the collection system.	12/31/88	***Completed by 12/31/88.***

Table 5.1.1.3-1 Hillside Seepage		
RAP Requirements	**Required Date of Completion**	**Site Status 10/14/99**
S Hillside and toe-berm seepage will continue to be collected.	Until concentrations are less than ground water agricultural-use criteria and which would not cause a violation of the San Miguel River surface water criteria	***Ongoing.***
S Collected liquids shall be disposed in the Club Ranch Ponds until lined evaporation Ponds in the Club Ranch Pond Area are available.	11/1/87	***Completed by 12/31/88.*** Lined Club Ranch Evaporation Ponds #7 and 8 were installed in 1988.
S The lined Club Ranch Ponds shall be designed, constructed, and installed with a synthetic liner to prevent the migration of any hazardous constituents into the subsurface soil, ground water, or surface water during the operational life of the pond.	12/31/91 Note: RAP modified to permit completion by 12/31/92	***Completed by 12/31/92.***

Table 5.1.1.3-1 Hillside Seepage		
RAP Requirements	**Required Date of Completion**	**Site Status 10/14/99**
S Liquids may be stored in the lined surge pond on Tailings Pile #2 as approved by the State. The existing lined upper return pond located in the B-Plant Area may be utilized for liquids storage as long as it is required.	When it is no longer required	***Storage no longer needed and lined surge pond on Tailings Pile #2 and lined upper return pond in B-Plant Area taken out of service as of 10/15/99.***
2. An approved ambient river (upstream) and downstream San Miguel River monitoring program approved by the State shall be initiated.	No later than 120 days after entry of the Consent Decree	***Ongoing.***
3. An Annual Report of data collected in the San Miguel River and Hillside Seepage Collection System monitoring programs shall be submitted to the State.	Not later than March 31 of each year for each prior calendar year	***Completed each year as required***.
4. A Final Construction Report shall be submitted to the State.	Not later than 90 days after the completion of construction	***Completed.*** Submitted to the State in April 1989.
5. A Certification Report shall be submitted to the State.	Not later than 120 days after completion of all remedial activities	***Not required to-date as all remedial activities at the site have not been completed***.
6. A Seepage Collection System performance evaluation report shall be submitted to the State that discusses the effectiveness of monitor wells V-766 and CRP-15 to intercept flows to the San Miguel River.	Not later than March 31 of the sixth year of seepage collection and every fifth year thereafter	***Completed.*** Included as Appendix F in the 1994 Annual Report.

Table 5.1.1.3-1 Hillside Seepage		
RAP Requirements	**Required Date of Completion**	**Site Status 10/14/99**
7. Long-term monitoring and maintenance of the surface configuration, vegetation, and ground water shall be conducted pursuant to the Colorado Radioactive Materials License	Upon closure of the Uravan Facility	***Ongoing.***

5.1.2 Toe Berm Seepage and Tailing Dewatering Liquids

5.1.2.1 History

Liquids will be forced from the Tailings Piles during dewatering and consolidation and for some time prior to and after final reclamation. Seepage is collected by a toe drain system at the base of the slopes of the Tailings Piles and conveyed to the Club Ranch Ponds. UCC/Umetco estimates this seepage to be at a rate of approximately 30 gallons per minute. The hillside seepage is composed of geochemically-modified tailings solutions from the Tailings Pile and the Club Mesa Spray Area. The level of total dissolved solids and ionic concentrations are much lower than that of the parent solutions.

5.1.2.2 Remedial Objectives

Remediation activities will minimize the potential for discharge of contaminated surface waters to be released from the site into the San Miguel River, in violation of the site's surface water discharge prohibition.

5.1.2.3 Site Status and RAP Requirements

5.1.2.3.1 Status December 1993 (Excerpted from EPA 1993 Five Year Review, Umetco 1997 Five Year Review, CDPHE 1999 Uravan Remedial Action Plan Status Report)

Liquids were being collected by the toe drain system and transferred to the lined Club Ranch Ponds. Flow rates had decreased from approximately 30 gallons per minute to less than 5 gallons per minute. In 1991, the toe drains flow averaged 4.8 gallons per minute from Tailings Pile #1-2 and 3.3 gallons per minute from Tailings Pile #3. The toe drains for Tailing Piles #1-2 and #3 were flowing at 3.3 gallons per minute during the single measurement taken in August 1992.

Two evaporation ponds, Club Ranch Ponds #7 and #8, were constructed to handle the contaminated liquids intercepted by this project. These ponds were completed in May, 1988. One pond developed liner problems and was patched. A vent system was also placed under the liners to prevent the formation of gas bubbles under the liners. The liner and vent work was completed in mid-December 1990.

5.1.2.3.2 Status October 1999 (Excerpted from Umetco 1997 Five Year Review, CDPHE 1999 Uravan Remedial Action Plan Status Report)

Liquids continue to be collected by the toe drain system, Figure 5.1.2-1, and transferred to the Tailings Water Return Pond. These liquids are then transferred to the lined Club Ranch Evaporation Ponds for evaporation. Flow rates from Tailings Piles #1-2 and #3 have decreased from approximately 30 gallons per minute in 1988 to less than 4.0 gallons per minute in 1998. The seepage flow in 1998 is more than that reported for 1997, i.e., 3 gallons per minute. The difference was explained by Umetco to be due to maintenance conducted on the toe drain system in 1998. The drain system was mechanically cleaned with clear water in the spring of 1998, thereby removing built-up solids.

In 1999, a new lined Tailings Return Water Pond on Club Mesa is to be installed that would replace the current Tailings Return Pond that is located inside the new B-Plant Repository footprint. In addition to the replacement of the Pond, existing toe drain lines located below Tailings Piles #1-2 and #3 and within the B-Plant Repository footprint are to be abandoned and new lines installed along the perimeter of the new B-Plant Repository. The new drain lines would also be constructed of 4 inch diameter HDPE. Existing toe drain sumps and other toe drain lines are to remain in place. This project is to be completed by December 31, 1999.

Table 5.1.2.3-1 summarizes the major requirements for remedial activities at the River Ponds Area specified in Section 5.1.2.2 of the RAP, required completion dates as specified in Section 5.1.2.4 of the RAP, and status as of October 14, 1999.

5.1.2.4 Summary of Site Visit Observations and Findings

The site visits of October 13 and 14, 1999 visually found the Toe Drain Collection System to be operating as intended. Parts of the toe drain systems were visible along the toes of Tailings Pile #1-2 and #3. Vertical clean out vents were also visible along the toes of the Tailings Piles. The drains led to various collection sumps. From there, the liquids were transferred to the lined Club Ranch Ponds. A new toe drain system was currently being installed along the toe of the B-Plant Repository. This construction appeared to be conducted in accordance with the RAP. The new lined Return Water Pond was also observed during the visit. Umetco personnel indicated during the visit that construction of the new Return Water Pond was completed and should be placed into service within a few days after the new toe drain lines were installed and connected to the Pond. Tailings Pile #1-2 toe drain sump #2 was observed during the visit. It was

a large concrete structure that appeared to be maintained and in good condition. A small quantity of fluid was present inside the sump. According to Umetco personnel, several pumps had to be rebuilt recently to ensure continued, uninterrupted operation of this system.

A Final Construction Report for the existing Toe Berm Seepage System has not been submitted to the State for review.

5.1.2.5 Photographs

Photo 5.1.2.5-1 shows Tailings Pile #1-2 toe drain sump #2 located at the northeast corner of Tailings Pile #1-2 as of October 1999. It is similar to others installed along the base of Tailings Piles 1-2 and Tailings Pile #3. Piping is similar to the new toe drain line being installed along the toe of the new B-Plant Repository. Photo 4.6-6 shows the old and new lined Return Water Pond on the new B-Plant Repository. The new Pond is located at the top of the photograph while the old Pond is located in the center of the right side of the photo.

Recommendations:

1. The Final Construction Report for the entire Toe Berm Seepage System should be submitted to the State as soon as the new system around the B-Plant Repository is completed.

Table 5.1.2.3-1 Toe Drain Collection System		
RAP Requirements	**Required Date of Completion**	**Site Status 10/14/99** ***95% Complete as of 10/14/99***
1. The following work activities shall be conducted for the Toe Drain Collection Seepage:		
S Trenches and sumps shall be constructed in selected areas of the Tailings Piles to enhance dewatering and consolidation of the tailings. The liquids collected shall be pumped to the lined evaporation ponds in the same manner as the contaminated hillside seepage.	As required and determined in the field	***Ongoing***
S The toe berm seepage shall continue to be collected in the existing collection system until such seepage ceases and shall be evaporated in the lined Club Ranch Ponds. Liquids are being collected by the toe drain system and are being transferred to the lined Club Ranch Ponds.	Until seepage ceases	***Ongoing***
S Collected liquids shall be disposed in the Club Ranch Ponds until lined evaporation Ponds in the Club Ranch Pond Area are available.	11/1/87	***Completed by 12/31/88*** Lined Club Ranch Evaporation Ponds #7 and 8 were installed in 1988.

Table 5.1.2.3-1 Toe Drain Collection System		
RAP Requirements	**Required Date of Completion**	**Site Status 10/14/99** ***95% Complete as of 10/14/99***
S The lined Club Ranch Ponds shall be designed, constructed, and installed with a synthetic liner to prevent the migration of any hazardous constituents into the subsurface soil, ground water, or surface water during the operational life of the pond.	12/3/191 Note: RAP modified to permit completion by 12/31/92	***Completed by 12/31/92.***
3. An approved ambient river (upstream) and downstream San Miguel River monitoring program approved by the State shall be initiated.	No later than 120 days after entry of the Consent Decree	***Ongoing.***
4. An Annual Report of data collected in the San Miguel River monitoring program shall be submitted to the State.	Not later than March 31 of each year for each prior calendar year	***Completed each year as required from 1993 through 1998***.
5. A Final Construction Report shall be submitted to the State.	Not later than 90 days after the completion of construction	***To be completed.***
6. A Certification Report shall be submitted to the State.	Not later than 120 days after completion of all remedial activities	***Not required to-date***. All remedial activities at the site have not been completed.

Table 5.1.2.3-1 Toe Drain Collection System		
RAP Requirements	**Required Date of Completion**	**Site Status 10/14/99** ***95% Complete as of 10/14/99***
7. A Seepage Collection System performance evaluation report shall be submitted to the State that discusses the effectiveness of monitor wells V-766 and CRP-15 to intercept flows to the San Miguel River.	Not later than March 31 of the sixth year of seepage collection and every fifth year thereafter	***Completed.*** Included as Appendix F of the 1994 Annual Report.
9. Long-term monitoring and maintenance of the surface configuration, vegetation, and ground water pursuant to the Colorado Radioactive Materials License	Upon closure	***Ongoing***

5.2 Ponded Liquids

5.2.1 Club Ranch Ponds

5.2.1.1 History

Contaminated liquid contained in the Club Ranch Ponds consisted primarily of toe drain and hillside seepage collected since mid-1985 and raffinate solution contained in the ponds since the last discharge of raffinate to the ponds in 1984. These liquids seeped into the subsurface at an undetermined rate. Ponded water evaporates at a rate of approximately two gallons per minute per acre.

5.2.1.2 Remedial Objectives

Remediation activities will minimize the potential for contaminated surface waters to be released into the underlying bedrock and aquifer.

5.2.1.3 Site Status and RAP Requirements

5.2.1.3.1 Status December 1993 (Excerpted from EPA 1993 Five Year Review, Umetco 1997 Five Year Review, CDPHE 1999 Uravan Remedial Action Plan Status Report)

Construction of two lined evaporation ponds, Club Ranch Ponds #7 and #8, was completed in May 1988. Liquids from the unlined Club Ranch Ponds #1 through #6, were then transferred into the lined Club Ranch Ponds. This liquid transfer was completed by December 31, 1988. ***Project 100 percent complete as of December 31, 1988.***

5.2.1.3.2 Status October 1999 (Excerpted from Umetco 1997 Five Year Review, CDPHE 1999 Uravan Remedial Action Plan Status Report)

Liquids are still collected in the lined Club Ranch Ponds. No further action was required by the RAP. The liner of Club Ranch Pond #8 was replaced in 1998. Minor maintenance activities to repair small holes or tears in the liners were completed on the lined Club Ranch Evaporation Ponds between 1993 and 1998. Additional discussions on the status of the Club Ranch Evaporation Ponds can be found in Section 4.2 of this document. ***The project is 100 percent complete as of October 14, 1999.***

Table 5.2.1.3-1 summarizes the major requirements for remedial activities at the Club Ranch Ponds Area specified in Section 5.2.1.2 of the RAP, required completion dates as specified in Section 5.2.1.4 of the RAP, and status as of October 14, 1999.

5.2.1.4 Summary of Site Visit Observations and Findings

The site visits of October 13 and 14, 1999 visually found the lined Club Ranch Ponds to be operating as intended. The unlined Club Ranch Ponds were removed from service, although their berms were still in place. The areas within the berms had been excavated down to the underlying bedrock. No liquids were observed inside the berms.

Recommendations:

1. None noted

Table 5.2.1.3-1 Club Ranch Ponds		
RAP Requirements	**Required Date of Completion**	**Site Status 10/14/99** ***Required Actions 100% Completed as of 10/14/99***
1. The following work activities shall be conducted for the Club Ranch Ponds: **S** All liquid waste in the existing unlined Club Ranch Ponds shall be evaporated in place. Movement of liquids from a Club Ranch Pond to another Club Ranch Pond is allowed	12/31/88	***Completed by 12/31/88.*** Liquids from unlined Club Ranch Ponds transferred into new lined Club Ranch Ponds #7 and 8 for evaporation.

5.2.2 Other Liquids

5.2.2.1 History

Liquids of an undetermined chemistry may accumulate in the River Ponds and the Storage Ponds on Club Mesa. Liquids, if not removed, will likely seep into the underlying subsurface zones from unlined ponds. Additional liquids were stored within the mill circuit, with a maximum storage capacity of 4,100,000 gallons.

5.2.2.2 Remedial Objectives

Remediation activities will minimize the potential for contaminated surface waters to be released into the underlying subsurface zones.

5.2.2.3 Site Status and RAP Requirements

5.2.2.3.1 Status December 1993 (Excerpted from EPA 1993 Five Year Review, Umetco 1997 Five Year Review, CDPHE 1999 Uravan Remedial Action Plan Status Report)

Construction of two lined evaporation ponds, Club Ranch Ponds 7 and 8, was completed in May 1988. Liquids from the River Ponds, were then transferred into the lined Club Ranch Ponds. The removal of the River Ponds was completed by December 31, 1989. ***The project was 100 percent complete as of December 31, 1993.***

Remediation of the Club Mesa Spray Disposal Area began in the summer of 1990 and was completed in 1992. ***The project was 100 percent complete as of December 31, 1993.***

Removal of liquids from the mill circuits had not started by end of December 1993. ***The project was 0 percent complete as of December 31, 1993***.

5.2.2.3.2 Status October 1999 (Excerpted from Umetco 1997 Five Year Review, CDPHE 1999 Uravan Remedial Action Plan Status Report)

Decommissioning of the mills, including removal of the liquids in the mill circuits, started in 1995 and was completed in 1999. ***The project is 100 percent complete as of October 14, 1999.***

Table 5.2.2.3-1 summarizes the major requirements for remedial activities at the Other Liquids specified in Section 5.2.1.2 of the RAP, required completion dates as specified in Section 5.2.1.4 of the RAP, and status as of October 14, 1999.

5.2.2.4 Summary of Site Visit Observations and Findings

During the site visits of October 13 and 14, 1999, the River Ponds were observed to be totally remediated, as discussed in Section 4.3 of this report. The unlined Club Mesa Storage Ponds were found to be removed and no longer in service, as discussed in Sections 4.2 and 5.2.1 of this report. Both the A- and B-Plants had been totally demolished and all mill circuit liquids removed from the respective areas, as discussed in Section 4.6 of this report.

Recommendations:

1. None noted.

Table 5.2.2.3-1 Other Liquids		
RAP Requirements	**Required Date of Completion**	**Site Status 10/14/99** ***Required Actions 100% Completed as of 10/14/99***
1. The following work activities shall be conducted for liquids in River Ponds, Storage Ponds on Club Mesa, and liquids in the mill circuit:		
S All liquids in River Ponds shall be pumped to the Club Ranch Ponds.	On an annual basis until the River Ponds are removed	***Remedial Actions Completed by 12/31/89.*** Liquids from the River Ponds transferred into new lined Club Ranch Ponds #7 and #8 for evaporation in 1989.
S All liquids in Storage Ponds on Club Mesa shall be pumped to the Club Ranch Pond.	On an annual basis until the Storage Ponds are removed	***Remedial Actions Completed by 12/31/92.*** Liquids from Storage Ponds on Club Mesa transferred into new lined Club Ranch Ponds #7 and #8 for evaporation by the end of 1992.
S Liquids within the mill circuit shall be disposed of in lined ponds.	As necessary and in a manner so as not to delay other scheduled RAP activities	***Remedial Actions Completed by 12/31/95.***

5.3 Surface Runoff

5.3.1 History

Surface water runoff from the Umetco Uravan Superfund Site will continue to occur after reclamation of the facilities. Hydrology studies for the existing and reclaimed facilities were conducted for UCC/Umetco by Dravo Engineers. Water quality of the storm runoff was undefined but would be governed by Section 5.3.3 of the RAP.

5.3.2 Remedial Objectives

Remediation activities will minimize the potential for contaminated surface waters to be released into the San Miguel River.

5.3.3 Site Status and RAP Requirements

5.3.3.1 Status December 1993 (Excerpted from EPA 1993 Five Year Review, Umetco 1997 Five Year Review, CDPHE 1999 Uravan Remedial Action Plan Status Report)

The surface water runoff control facilities have been maintained and monitored since implementation of the RAP in 1987. These activities will continue until the related remedial activities are completed.

5.3.3.2 Status October 1999 (Excerpted from Umetco 1997 Five Year Review, CDPHE 1999 Uravan Remedial Action Plan Status Report)

Figure 5.3.3-1 shows the Runoff Collection System. Existing Runoff Control Ponds RC-1, RC-2, and RC-4 were replaced in 1998. Replacement Pond RC-2 was placed into service during the fourth quarter of 1998. Lined Replacement Pond RC-4 was placed into service and the previous RC-4, e.g., the "Swimming Pool", was demolished during the first quarter of 1999. Replacement Pond RC-1 will be placed into service after its diversion piping system is completed in the fourth quarter of 1999. The existing Runoff Control Pond, RC-3, remains in service as of October 1999.

The surface water runoff control facilities have been maintained and monitored since implementation of the RAP in 1987. These activities will continue until the related remedial activities are completed.

Table 5.3.3-1 summarizes the major requirements for remedial activities for the Surface Runoff specified in Section 5.3.2 of the RAP, required completion dates as specified in Section 5.3.4 of the RAP, and status as of October 14, 1999.

5.3.4 Summary of Site Visit Observations and Findings

Surface waters coming off the Club Mesa Areas are collected initially in the Hillside Seepage Collection Systems, consisting of shotcrete-lined drainage ditches and associated sumps. Surface water collected in the sumps is then pumped and/or gravity drained to one of two unlined runoff collection ponds, RC-1 or RC-2, depending on the location of the sumps. Surface water collecting in RC-3 comes from drainage off the northeast end of Club Mesa. Water from these ponds is pumped within 30 days of collection to the lined runoff collection pond RC-4. Water from RC-4 is then transferred to the lined Club Ranch Ponds.

The site visits of October 13 and 14, 1999 visually found the surface water control system in good condition and functioning as intended. None of the four runoff collection ponds contained water during the visits. As discussed in Section 5.1.11, the lined drainage Hillside Seepage Collection System ditches had recently been repaired and were in good condition.

Recommendations:

1. None noted.

Table 5.3.3-1 Surface Water Runoff		
RAP Requirements	**Required Date of Completion**	**Site Status 10/14/99** ***Remedial Actions Ongoing as of 10/14/99***
1. The following work activities shall be conducted for Surface Water Runoff:		
S UCC/Umetco shall design, maintain, and operate the runoff collection and sedimentation ponds to contain a 10-year, 24-hour storm event.	As specified in the Approved Final Plans and Specifications	***Designed, maintained, and operated as required as of 12/31/86.***.
S In the event of a storm in excess of a 10-year, 24-hour storm event, the overflow shall be discharged to the San Miguel River.	As required	An overflow of the surface water control ponds has not occurred as of 10/14/99.
S Operations shall include procedures for restoring the pond capacity following a major precipitation event. Liquids detained from surface precipitation runoff shall only be used as follows: • Evaporated in the Club Ranch Ponds • Used as construction water for dust control on top of the Tailings Piles or for compaction of contaminated material.	Within thirty (30) days	***Ongoing.*** Procedures have been written. Liquids used as specified.
2. Clarified liquid and runoff shall be analyzed at least once every two years for specified parameters.	Every two years	***Ongoing.***

Table 5.3.3-1 Surface Water Runoff		
RAP Requirements	**Required Date of Completion**	**Site Status 10/14/99** ***Remedial Actions Ongoing as of 10/14/99***
3. If overflow occurs, runoff shall be analyzed for additional specified parameters.	When overflow occurs	***Not required to-date***. An overflow of the surface water control ponds has not occurred as of 10/14/99.
4. A Performance Evaluation Program for the Sedimentation Ponds shall be initiated to verify that the ponds are functioning as designed. If the State determines prior to closure that performance levels have not been achieved, UCC/Umetco shall propose and implement additional remedial action.	As required	***Not required to-date by State***.
5. Long-term monitoring and maintenance, if any, after closure of the Uravan Facility shall be conducted pursuant to the Colorado Radioactive Materials License	As required by the Colorado Radioactive Materials License	***Not required to-date by State***. Uravan Facility has not closed

5.4 Ground Water

5.4.1 Club Mesa Salt Wash Member of the Morrison Formation

5.4.1.1 History

Seepage from Uravan Mill operations and waste disposal has infiltrated into the Salt Wash and has created a body of perched fluids on Club Mesa. This infiltration primarily consists of raffinate from the Club Mesa Spray Area and seepage from the Tailings Piles. Hydrologic data monitoring wells constructed into the Salt Wash indicate that the areal extent of the fluids is in the area beneath and down gradient from the three Tailings Piles and the spray evaporation area. The direction of flow is to the northeast towards the valley walls of the San Miguel River and Hieroglyphic Canyon. Discharge of this contamination from the Salt Wash occurs as a series of hillside seeps on the face of the valley walls.

5.4.1.2 Remedial Objectives

Remediation activities will minimize the potential for contaminated subsurface waters to be released into the San Miguel River.

5.4.1.3 Site Status and RAP Requirements

5.4.1.3.1 Status December 1993 (Excerpted from EPA 1993 Five Year Review, Umetco 1997 Five Year Review, CDPHE 1999 Uravan Remedial Action Plan Status Report)

Four wells were completed in this formation, V-763S, V-770, V-771, and V-772, and were monitored annually. All four wells had elevated concentrations of TDS, sulfate, and dissolved natural uranium. Monitoring results of three of the four wells from 1988 through 1993 showed little change in water quality. The fourth well, V-772, had steady increases in TDS, chloride, sulfate, and ammonia. Water levels were consistent from 1988 through 1993, indicating that the ground water system has reached a point of relative equilibrium.

5.4.1.3.2 Status October 1999 (Excerpted from Umetco 1997 Five Year Review, CDPHE 1999 Uravan Remedial Action Plan Status Report)

Four wells are completed in this formation, V-763S, V-770, V-771, and V-772, to monitor the raffinate solutions perched on the Summerville Formation, Figure 5.4.1-1. Appendix 3 summarizes the monitoring results for these four wells, as reported in the Umetco Uravan Revised 1996 and 1998 Annual Environmental Monitoring Reports. Monitoring results for 1997 were not evaluated during this Five-Year Review, as the 1997 Annual Environmental Monitoring Report was unavailable for review. In addition, results for Well V-771 were not included in the 1998 Annual Environmental Monitoring Report. With a few notable exceptions, monitoring wells V-770, V-771, and V-763S generally showed a relatively consistent water quality between 1994 and 1998. Concentrations of most contaminants fluctuated throughout this time period. However, in 1998, monitoring well V-770 showed an increase in radium-226 concentrations over those seen in previous years. Monitoring results for well V-772 in 1998 showed increased concentrations of ammonia, calcium, chlorides, manganese, potassium, sodium, sulfates, TDS, vanadium, and zinc. These results demonstrate that contaminant concentrations in this aquifer are not decreasing very quickly.

Water levels in these monitoring wells between 1993 and 1998 were generally constant. However, in 1998, the level of monitoring well V-763S was at its lowest level since 1985 and monitoring wells V-770 and V-772 were at their highest levels measured to-date.

The RAP requires monitoring of wells V-762, V-763S, V-764S, V-770, V-771, and V-772. No information was available for review from 1993 to 1998 as to whether wells V-762 and V-764S have been abandoned or whether monitoring of only the four wells was approved by the State.

Table 5.4.1.3-1 summarizes the major requirements for remedial activities at the Club Mesa Salt Wash Monitoring Wells specified in Section 5.4.1.2 of the RAP, required completion dates as specified in Section 5.4.1.4 of the RAP, and status as of October 14, 1999.

5.4.1.4 Summary of Site Visit Observations and Findings

The site visit of October 12 and 13, 1999 did not find any observations of note regarding these wells.

Recommendations:

1. If monitoring well V-771 actually was monitored in 1998, these values should be placed into the 1998 Annual Report. Otherwise, the Annual Report should be amended with an explanation or note indicating why it was not sampled.

2. Information should be provided in the Annual Reports indicating the status of monitoring wells V-762 and V-764S.

Table 5.4.1.3-1 Club Mesa Salt Wash Member of the Morrison Formation		
RAP Requirements	**Required Date of Completion**	**Site Status 10/14/99** ***Ongoing as of 10/14/99***
1. The following work activities shall be conducted for the Club Mesa Salt Wash Member of the Morrison Formation: **S** UCC/Umetco shall collect and dispose of contaminated hillside and toe berm seepage. **S** UCC/Umetco shall monitor the Salt Wash Wells on Club Mesa as prescribed in Addendum A: • V-762 • V-763S • V-764S • V-770 • V-771 • V-772.	Within 60 days of approval by State	***Completed*** ***Partially completed*** Note: Monitoring wells V-762 and V-764S are not included in annual monitoring. 1998 monitoring results for well V-771was not available for review.
2. Sample results shall be compiled in an Annual Report submitted to the State by March 31 of the following calendar year.	3/31/87	***Completed and ongoing***

Table 5.4.1.3-1 Club Mesa Salt Wash Member of the Morrison Formation		
RAP Requirements	**Required Date of Completion**	**Site Status 10/14/99** ***Ongoing as of 10/14/99***
3. Performance evaluation for the Salt Wash Formation shall be a description of monitor well data for comparison to past information.	In each Annual Report	***Completed and ongoing***
4. Long-term monitoring and maintenance, if any, after closure of the Uravan facility shall be conducted pursuant to the Colorado Radioactive Materials License.	Pursuant to the Colorado Radioactive Materials License	***Not required to-date.*** The Uravan facility has not closed.

5.4.2 Club Mesa - Kayenta-Wingate Sequence

5.4.2.1 History

UCC/Umetco's past operations on Club Mesa and past waste disposal activities pose potential impact to the ground water quality in the Kayenta-Wingate aquifer beneath Club Mesa. Past activities which could potentially impact the aquifer were the use of the Club Mesa Spray Area and Tailings Piles. These activities have ceased and the areas reclaimed. Seepage of infiltrated raffinate and seepage of liquid from the Tailings Piles is collected and is expected to abate over time.

The low permeability of the Summerville shale formation above the Kayenta-Wingate aquifer prevents or retards significant contaminant movement down to the Kayenta-Wingate. In 1986, UCC/Umetco drilled wells V-768 and V-769 into the Kayenta-Wingate Formation beneath Club Mesa. These wells showed no significant contamination at the time that they were drilled.

5.4.2.2 Remedial Objectives

Sampling of Club Mesa wells that monitor the Kayenta-Wingate Formation shall provide data for continuing confirmation that ground water quality in the Kayenta-Wingate Formation is acceptable.

5.4.2.3 Site Status and RAP Requirements

5.4.2.3.1 Status December 1993 (Excerpted from EPA 1993 Five Year Review, Umetco 1997 Five Year Review, CDPHE 1999 Uravan Remedial Action Plan Status Report)

Six monitoring wells were completed on Club Mesa in the Kayenta/Wingate Formations. Three of the wells had been monitored seven times between 1988 and 1992. The other three wells were newly installed and were monitored only in 1991 and 1992. Water levels in all of these wells had not reflected much change. Of the six wells, samples from three showed high concentrations of sulfates and TDS. Samples from two of the wells showed high dissolved natural uranium ranging from 261 to 1,400 pCi/L. Concentrations of the other radionuclides are relatively low. Monitoring wells V-766A and CRP-15 appeared to show some increases in concentration of several analytes from 1991 to 1992. However, these increases appeared to be within the normal ranges of concentrations exhibited in the past. The other three wells appear relatively uncontaminated, with TDS levels in samples about one-third, sulfates about one-

twentieth, and uranium an order of magnitude lower than concentrations in samples from uncontaminated wells.

5.4.2.3.2 Status October 1999 (Excerpted from Umetco 1997 Five Year Review, CDPHE 1999 Uravan Remedial Action Plan Status Report)

Umetco reports that monitoring wells CM93-1, CM93-2, CM93-3, V-768, and V-769, Figure 5.4.1.1-1, were constructed to monitor the Kayenta/Wingate aquifer beneath Club Mesa. Addendum A of the RAP requires monitoring of wells V-766, V-768, V-769, CRP-15, and CRP-16. However, none of the documents reviewed during this Five Year Review discussed the other differences observed in the monitoring program (e.g., no monitoring of CRP-16 and annual monitoring of CM93-1, CM93-2, and CM93-3) or that the RAP was revised to approve the differences in the monitoring program.

As summarized in Appendix 4, concentrations of most analytes in the monitoring wells fluctuated throughout this time period, but the concentrations were generally within the historical range of values observed during previous sampling events. However, there were some changes of note. 1998 Monitoring well CM93-1 showed an increase between 1994 and 1998 for TDS, iron, and zinc. Also in 1998, monitoring well CM93-2 showed decreased bicarbonate and zinc concentrations over those seen in previous years, whereas the arsenic, chloride, iron, manganese, sulfates, TDS, gross alpha, and polonium-228 values increased. Monitoring well CM93-3 exhibited large increases in radium-228, natural uranium, and sodium concentration in June 1996, June 1998, and June 1998, respectively, but these contaminants quickly returned to values within the general range of concentrations seen in other monitoring events. The results of 1998 monitoring results for well Monitoring well V-768 had increased concentrations of nitrate + nitrite and natural uranium, but had decreased concentrations of calcium, chloride, sodium, sulfate, and TDS in 1998. Monitoring well V-769 showed decreased concentrations of TDS, zinc, gross alpha, and radium-226, and increased concentrations of ammonia, magnesium, potassium, and radium-228 in 1998.

Wells CRP-15 and V-766A are monitored to review the effectiveness of the Hillside Seepage Collection System. V766A showed decreased concentrations for most analytes as compared to previous results. Manganese and radium-228 were the sole analytes that increased during 1998 in monitoring well V-766A. With the exception of 1998 results, a few analytes show a trend in increasing concentrations over time, including gross alpha and uranium. Results for monitoring well CRP-15 didn't show discernible general trends between 1993 and 1998 for most analytes with the exception of ammonia, bicarbonate, and sulfates which showed general decreasing trends.

Water levels in these monitoring wells between 1993 and 1998 generally fluctuated between sampling events. Variations of ± two to four feet were common. However, well CM93-2 showed more than a 20-foot drop in level at the end of 1998. The reason for this large decrease in water level in CM93-2 was not explained by Umetco. None of the other wells demonstrated a similar decrease.

Table 5.4.2.3-1 summarizes the major requirements for remedial activities at the Club Mesa Kayenta/Wingate Monitoring Wells specified in Section 5.4.2.2 of the RAP, required completion dates as specified in Section 5.4.2.4 of the RAP, and status as of October 14, 1999.

5.4.2.4 Summary of Site Visit Observations and Findings

The site visit of October 12 and 13, 1999 visually found the ground water monitoring wells installed in the Club Mesa. Proper installation and operation of the wells could not be confirmed by visual observation.

Recommendations:

1. If monitoring well CRP-16 actually was monitored between 1993 and 1998, these values should be placed into the Annual Reports. Otherwise, the Annual Reports should be amended with an explanation or note indicating why this well was not sampled. Future reports should reflect the change in the RAP regarding monitoring wells CRP93-1, CRP93-2, and CRP93-3.

Table 5.4.2.3-1 Club Mesa Kayenta-Wingate Sequence		
RAP Requirements	**Required Date of Completion**	**Site Status 10/14/99** ***Ongoing as of 10/14/99***
1. The following work activities shall be conducted for the Club Mesa Monitoring Wells of the Kayenta-Wingate Sequence: **S** Monitoring wells shall be monitored as required in Addendum A of the RAP, e.g., at least annually. **S** The following wells shall be monitored: • V-766 • V-768 • V-769 • CRP-15 • CRP-16.	12/31/88 Annually by March 31 for the prior calendar year	***Partially completed each year as required***. ***Partially completed each year as required***. Note: CRP-16 was not monitored as required by RAP. CM93-1, CM93-2, and CM93-3 monitored, but are not included in the RAP.
2. UCC/Umetco shall submit the compiled Club Mesa Kayenta-Wingate data and a brief analysis as part of the Annual Report.	Annually by March 31 for the prior calendar year	***Completed each year as required***.
3. A performance evaluation report of the Club Mesa Kayenta-Wingate shall be submitted to the State that compares the monitoring well data to past information.	Annually by March 31 for the prior calendar year	***Completed each year as required***.

Table 5.4.2.3-1 Club Mesa Kayenta-Wingate Sequence		
RAP Requirements	**Required Date of Completion**	**Site Status 10/14/99** ***Ongoing as of 10/14/99***
4. A proposed long-term monitoring program shall be submitted.	Not later than ninety (90) days prior to completion of Uravan Facility remedial activities	***Not required to-date***. All remedial activities at the site have not been completed.
5. Long-term monitoring, if any, after closure of the Uravan facility shall be conducted pursuant to the Colorado Radioactive Materials License.	Upon closure of the Uravan Facility	***Not required to-date***. The Uravan Facility has not closed.

5.4.3 River Valley - Kayenta-Wingate Sequence

5.4.3.1 History

UCC/Umetco's liquid waste handling and disposal operations in the river valley released contaminants into the Kayenta-Wingate aquifer. The most significant contribution to ground water contamination was the disposal of liquid raffinate in the unlined Club Ranch Ponds. Seepage from the Club Ranch Ponds has been found in monitoring wells beneath and down gradient from the ponds.

The ground water system in the river valley is a complex, fractured aquifer that maintains a recharge-discharge relationship with the San Miguel River. The monitoring well system in the river valley has measured contamination in the fracture system. This contaminated ground water acts as a source of non-point contamination to the San Miguel River. The sandstone matrix likely produces very little liquid relative to the fractures, and may contribute contaminants to the fracture system at a relatively slow rate.

5.4.3.2 Remedial Objectives

As stated in the RAP, the goal of the remedial activities for aquifer restoration is to remove fracture contamination and improve ground water quality to a beneficial use. Achieving this goal, coupled with the removal of crystals and ponded liquids from the river valley, will substantially reduce the contaminated non-point load to the river. As stated in the RAP, this will significantly reduce the impact of the non-point load on the river quality. The remedial program is designed to achieve this goal within seven (7) years, with up to four (4) years additional pumping.

5.4.3.3 Site Status and RAP Requirements

5.4.3.3.1 Status December 1993 (Excerpted from EPA 1993 Five Year Review, Umetco 1997 Five Year Review, CDPHE 1999 Uravan Remedial Action Plan Status Report)

Two new withdrawal wells and several new monitoring wells were installed in a two-phase program beginning in 1991. The second phase of well installation was performed in February and March of 1992. The original monitoring wells for this area were determined to be improperly constructed to allow downward migration of contaminants from the alluvium into the Kayenta Formation. Samples obtained from these wells were considered to falsely indicate contaminant concentrations in the bedrock of the

Kayenta Formation. The report on the installation of the new wells indicates that 14 pre-existing wells were abandoned.

The new Club Ranch Ponds wells were screened at different depths than previous wells. The completion of the lined Club Ranch Ponds prevented ground water monitoring results to be influenced by water infiltration from the previous unlined ponds.

Extraction wells had removed 36.4 million gallons of contaminated ground water by the end of 1992. The water was placed into lined Club Ranch Evaporation Ponds #1, #4, and #6.

Drawdown effects were noted in some monitoring wells. Some improvement was considered to be taking place based upon available data. It was not considered possible to assess the effectiveness nor predict the time frame needed for remediation. The extraction of ground water from the fractures and bedding planes of the Kayenta Formation would remove contaminants easily, but the diffusion of contaminants out of the lower permeability matrix of the Kayenta Formation was considered to take a much longer period of time.

From 1991 to 1992, most of the monitoring well network was replaced, including: CRP-2 through 14. Figure 5.4.3.3-1 shows the monitoring and extraction well locations. Only monitoring wells CRP-1, CRP-15, CRP-16, CRP-17, and CRP-18 remained from the original monitoring well network. During replacement of the initial CRP wells, five well clusters, CRP-6 through CRP-9 and CRP-19, were installed to also observe the vertical extent of ground water contamination.

5.4.3.3.2 Status October 1999 (Excerpted from Umetco 1997 Five Year Review, CDPHE 1999 Uravan Remedial Action Plan Status Report)

In 1994, three monitoring wells, CRP-19B, CRP-19C, and CRP-21 were added to the extraction system to provide additional extraction capabilities to the existing extraction wells WD1 and WD2. During the period of 1991 to 1996, the extraction well network removed approximately 5,700 tons of dissolved solids from the Kayenta aquifer. Figure 5.4.4.3-2 shows the locations of the monitoring and withdrawal wells as of March 1994.

In 1996, two new withdrawal wells, WD3 and WD4, were constructed. Withdrawal well WD3 was constructed in the high permeable area near CRP-3. WD4 was constructed in the low permeable area between CRP-2 and the San Miguel River. The wells were constructed of 6-inch PVC casing to a depth

of 150 feet, with 100 feet of screened interval. From 1997 through 1998, approximately 1,100 tons of dissolved solids were removed from the Kayenta aquifer using withdrawal wells WD1, WD2, WD3, WD4, and converted monitor wells CRP-19A, CRP-19B, CRP-19C, and CRP-21. Figure 5.4.4.3-3 shows the locations of the monitoring and withdrawal wells, as of October 1999.

As discussed in Section 4.2, in 1997 Umetco excavated several trenches in the old, unlined lower Club Ranch Evaporation Ponds #2, #3, and #5. Perched liquid encountered during the excavation was collected and pumped into the lined Club Ranch Evaporation Ponds. Approximately 980,000 gallons of water and 540 tons of dissolved solids were removed by the trenches in 1997 and approximately 430,000 gallons of water were removed in 1998.

In 1998, four new withdrawal wells, WD5 through WD8, were constructed. In addition, four new monitor wells were drilled, but one was abandoned prior to completion. The three monitoring wells that were completed included CRP-24, CRP-25, and CRP-26.

At the end of 1998, the well network consisted of the following:

Monitoring Wells Constructed in the High Permeability Zone

- CRP- 8A and 8B
- CRP- 9A, 9B, and 9C
- CRP- 19A, 19B, and 19C

Monitoring Wells Constructed in the Low Permeability Zone

- CRP- 6B and 6C
- CRP- 7A, 7B, and 7C
- CRP- 8C
- CRP- 20
- CRP- 21
- CRP- 22
- CRP- 23
- CRP- 24
- CRP- 25
- CRP- 26

Extraction Wells Constructed in the High Permeability Zone

- CRP-3
- CRP- 19B and 19C (Monitoring wells also)
- WD1
- WD2
- WD3

Extraction Wells Constructed in the Low Permeability Zone

- CRP-2
- CRP-21 (Monitoring well also)
- WD4
- WD5
- WD6
- WD7
- WD8

Umetco also constructed four new monitoring wells, TD981 through TD984, in 1998 to investigate trends in Point of Compliance (POC) Well CRP-18 and to determine the down gradient extent of contamination from the Club Ranch Ponds. Well CRP-18 is located northwest of the Club Ranch Ponds at the approximate location of the Highway Air Monitoring Station on Highway 141.

Overall, it is estimated by Umetco that ground water extraction activities from 1992 through 1998 resulted in the removal of more than 200,000,000 gallons of contaminated ground water and 7,000 tons of dissolved solids from the Kayenta aquifer.

Ground water monitoring was conducted as required between 1993 and 1998, with the exception of well CRP-16 which was not sampled during this period. CRP-16 was not reported by Umetco as being replaced and/or abandoned during this time period.

Appendix 5 summarizes the ground water monitoring results for the River Valley Kayenta-Wingate monitoring wells. Comparison of ground water monitoring results from 1992 through 1998 demonstrate a significant reduction in TDS concentrations due to ground water extraction activities and natural flushing of gravels in the Kayenta aquifer. TDS concentrations in areas of high permeability decreased an average of 73 percent while TDS concentrations in low permeability areas decreased an average of 37 percent from

their historical maximum concentrations. Average concentrations of key indicator contaminants (e.g., sulfate, ammonia, chloride, and uranium) also decreased during this time period.

Comparison of 1992 through 1998 monitoring results also indicate a general trend towards equilibrium concentrations of indicator contaminants. Isopleth maps of TDS concentrations throughout the Club Ranch Ponds Area prepared for the years of 1983, 1992, and 1998 also show a reduction in lateral extent of high TDS concentrations throughout the area and a consolidation of the higher concentrations towards central areas.

In 1999 Umetco concluded that additional pumping of the high permeability zones did not appear warranted. The basis for this conclusion was that:

- Concentrations of TDS and other ground water contaminants had reached equilibrium concentrations
- Statistical analysis of 1998 background monitoring well and 1998 point-of-compliance monitoring well results did not find any difference between any constituent concentrations at the 95 percent confidence limit
- Additional contaminants requiring a background comparison had concentrations below the detection limit
- None of the contaminants with prescribed ground water protection standards exceeded their respective limits.

Umetco did consider that additional improvement of contaminant concentrations in the zones of lower permeability could still be realized with the additional extraction wells completed in the lower permeability zones in 1998 and implementation of Umetco's 1998 Ground Water Optimization Program.

In the January 1998 *Proposal to Maintain Optimal Ground Water System Performance, Uravan, Colorado,* Umetco demonstrated an average difference of 71 percent in areas of high permeability with a lesser reduction in TDS concentrations in low permeability areas, e.g., an average difference of 34 percent, from historical maximum concentrations through the second quarter of 1997. Table 5.4.3.3.2-1 compares the January 1998 data, obtained through the second quarter of 1997, with the January 1999 data which was generated through the last quarter of 1998. Data on the percent difference compares the respective year with 1992 data.

Table 5.4.3.3.2-1
Comparison of TDS Concentrations in River Valley Wells
Maximum Concentrations, 1997 Concentrations, and 1998 Concentrations

Well	Max. TDS	1997 TDS	% Difference (1997/Max)	4th Quarter 1998 TDS	% Difference (1998/Max)	% Improvement 1997 - 1998
High Permeability Zone						
CRP-8A	61,000	8,170	87%	4,300	93%	+6%
CRP-8B	3,900	1,680	57%	1,740	55%	-2%
CRP-9A	39,100	7,270	81%	8,030	79%	-2%
CRP-9B	13,700	4,930	64%	4,420	68%	+4%
CRP-9C	24,800	8,250	67%	5,610	77%	+10%
CRP-19A	30,200	9,490	69%	9,550	68%	-1%
CRP-19B	40,000	11,800	71%	11,300	72%	+1%
CRP-19C	31,100	9,140	71%	8,800	72%	+1%
AVERAGE	30,475	7591	**71%**	6,719	**73%**	+2%
Low Permeability Zone						
CRP-6B	6,590	5,940	10%	5,760	13%	+3%
CRP-6C	18,600	9,430	49%	9,350	50%	+1%
CPR7A	72,400	54,300	25%	47,000	35%	0.4
CRP-7B	43,600	21,100	52%	19,800	55%	+3%
CRP-7C	56,200	50,200	11%	46,400	17%	+6%
CRP-8C	4,080	3,300	19%	3,390	17%	-2%
CRP-20	34,900	18,900	46%	21,000	40%	-6%
CRP-21	40,000	26,500	34%	22,900	43%	+9%
CRP-22	4,090	1,520	63%	1,260	69%	+6%
CRP-23	9,000	6,180	31%	6,300	30%	-1%

Well	Max. TDS	1997 TDS	% Difference (1997/Max)	4th Quarter 1998 TDS	% Difference (1998/Max)	% Improvement 1997 - 1998
AVERAGE	23,888	19,737	**34%**	10,630	**37%**	+3%

Although several wells in the high permeability zone either have or are approaching an equilibrium condition with only ±1-2 percent difference between 1997 and 1998 values, a few wells e.g., CRP-8A, CRP-9B, and CRP-9C, are still undergoing greater change of ±5-10%.

Review of the ground water monitoring results identified the following apparent inconsistencies:

- CRP-7B: Monitoring results for December 1995 and January 1996 are identical indicating an possible error in data recording

- CRP-19B: Monitoring results for January 1996 are listed as "0", "0.00", or "0.000". Other than for the radionuclides, it is technically impossible to have an analytical result of 0; results are typically reported as "lower than detection limit" or similar wording

- CRP-21: Monitoring results for September 1995 and October 1995 are identical indicating an a possible error in data recording

- CRP-21: Monitoring results for molybdenum in December 1994 and March 1995 are listed as "0.00". Other than for the radionuclides, it is technically impossible to have an analytical result of 0; results are typically reported as "lower than detection limit" or similar wording

- WD-2: Most monitoring results for December 1996 and March 1997 are identical indicating an possible error in data recording

- WD-3 and WD-4: Monitoring results for November 21, 1996 and December 1996 are listed as "0", "0.00", or "0.000". Other than for the radionuclides, it is technically impossible to have an analytical result of 0; results are typically reported as "lower than detection limit" or similar wording

- On several occasions, the entire suite of analytes were not analyzed for these monitoring wells. Instead, "NA" or "Not Analyzed" was recorded in the respective Annual Environmental Monitoring Report. The reason(s) for the missing data was not explained by Umetco.

Final Construction Reports for lined Club Ranch Ponds #1, #4, and #6 have not been submitted to the State. Final Construction Reports for lined Club Ranch Ponds #7 and #8 were submitted to the State in July 1990. Final Construction Reports for the new ground water wells were submitted to the State in January 1999, but Construction Reports for ground water monitoring and extraction wells completed prior to 1999 have not been submitted to the State.

Table 5.4.3.3-1 summarizes the major requirements for remedial activities at the Club Ranch Ponds Area specified in Section 5.4.3.2 of the RAP, required completion dates as specified in Section 5.4.3.4 of the RAP, and status as of October 14, 1999.

5.4.3.4 Summary of Site Visit Observations and Findings

The site visits of October 13 and 14, 1999 visually found the ground water monitoring wells installed in the Club Ranch Area. Proper installation or operation of the wells could not be confirmed by visual observation.

Recommendations:

1. Final Construction Reports for lined Club Ranch Ponds #1, #4, and #6 and the ground water monitoring wells completed prior to 1999 should be submitted to the State as soon possible.

2. Although most of the wells completed in the high permeability zone have or are reaching equilibrium levels with no "significant" improvement and none of the contaminant concentrations exceeded their respective ground water protection standards, three of the wells do show greater change between mid-1997 and late-1998. It is recommended that:
   - **S** Ground water extraction from wells completed in the high permeability zones should be continued until a statistical comparison of each well can be completed, as required in Section 5.4.3.2.3 of the RAP
   - **S** Ground water extraction from wells completed in the low permeability zones should be continued until a statistical comparison of each well can be completed, as required in Section 5.4.3.2.3 of the RAP.

3. The analytical results for CRP-7B, CRP-21, and WD-2 should be reviewed to determine if the results were identical. If not, they should be revised, as required.

4. Analytical results less than the analytical method's lower limit of detection should be reported as such, rather than as "0".

5. All required parameters should be analyzed. When this is not possible, the respective Annual Environmental Monitoring Report should explain the discrepancy.

Table 5.4.3.3-1 San Miguel River Valley Kayenta-Wingate Sequence		
RAP Requirements	**Required Date of Completion**	**Site Status 10/14/99** ***Ongoing as of 10/14/99***
1. The following work activities shall be conducted for the San Miguel River Valley Monitoring Wells of the Kayenta-Wingate Sequence:		
S Monitoring wells shall be monitored as required in Addendum A of the RAP, e.g., at least annually.	Within 60 days following State approval of monitoring program	***Completed each year as required***.
S Data shall be collected during the Initial Sampling Program.	Within 60 days following State approval of monitoring program	***Completed.***
S UCC/Umetco shall submit the compiled Club Mesa Kayenta-Wingate data and a brief analysis as part of the Annual Report.	Annually by March 31 for the prior calendar year	***Completed each year as required.***
2. The restoration program shall consist of at least two (2) withdrawal wells: **S** Constructed in the areas of highest concentration of TDS in the vicinity of the Club Ranch Ponds **S** Completed in the zone of maximum contaminant concentrations in the fractured part of the aquifer **S** Designed to produce at least 30 gallons per minute.	12/31/91	***Completed.*** Extraction wells were constructed initially in 1991, with additional wells constructed in 1996.

Table 5.4.3.3-1 San Miguel River Valley Kayenta-Wingate Sequence		
RAP Requirements	**Required Date of Completion**	**Site Status 10/14/99** ***Ongoing as of 10/14/99***
3. Discharge from each well shall be pumped to lined evaporation ponds constructed in the Club Ranch Ponds Area after the area has been cleaned.	12/31/91	***Completed.*** Extracted ground water pumped to lined Club Ranch Ponds beginning in 1991.
4. The wells shall be pumped continuously or intermittently to optimize contaminant withdrawal from the aquifer at an annual average pumping rate of approximately 60 gallons per minute or other such rate determined to be necessary.	At all times during required operation of the system	***Ongoing.***
5. Pumping of the wells shall continue until performance criteria stated in the RAP are met.	Until ground water quality meets agricultural use criteria, the performance of the aquifer system no longer shows significant improvement, or the pumping system has been operating for eleven (11) years	***Ongoing.***
6. A ground water monitoring and data collection program shall be established according to Addendum A of the RAP.	Within 120 days after execution of Consent Decree	***Ongoing.***

Table 5.4.3.3-1 San Miguel River Valley Kayenta-Wingate Sequence		
RAP Requirements	**Required Date of Completion**	**Site Status 10/14/99** ***Ongoing as of 10/14/99***
7. A performance evaluation report of the San Miguel River Valley Kayenta-Wingate withdrawal system shall be submitted to the State.	Not later than ninety (90) days after the end of two years of ground water removal and then annually by March 31 for the prior calendar year	***Completed.***
8. A Final Construction Report shall be submitted to the State.	Not later than ninety (90) days after installation or construction of the lined Club Ranch Ponds and installation of any monitoring or withdrawal wells	***FINAL CONSTRUCTION REPORTS FOR THE LINE CLUB RANCH PONDS # 1, #4, AND #6 AND GROUND WATER MONITORING AND EXTRACTION WELLS COMPLETED PRIOR TO 1999 HAVE NOT BEEN SUBMITTED TO STATE AS REQUIRED BY THE RAP.*** Final Construction Reports for lined Club Ranch Ponds #7 and #8 were submitted to the State in July 1990. Final Construction Reports for the new ground water wells were submitted to the State in January 1999.

Table 5.4.3.3-1 San Miguel River Valley Kayenta-Wingate Sequence		
RAP Requirements	**Required Date of Completion**	**Site Status 10/14/99** ***Ongoing as of 10/14/99***
9. A Certification Report shall be submitted to the State.	Not later than 120 days after completion of remedial activities at the Uravan Facility	***Not required to-date.*** All remedial activities at the site have not been completed.
10. A proposed long-term monitoring program shall be submitted	Not later than ninety (90) days prior to completion of Uravan Facility remedial activities	***Not required to-date.*** All remedial activities at the site have not been completed.
11. Long-term monitoring and maintenance of the Hillside Seepage Collection System	Pursuant to the Colorado Radioactive Materials License	***Not required to-date***. All remedial activities at the site have not been completed.

6.0 MISCELLANEOUS REMEDIAL ACTION PLAN REQUIREMENTS

6.1 Off-Site Dose Limits

6.1.1 Requirements

UCC/Umetco shall conduct remedial activities in such a manner as to provide reasonable assurance that the annual radiation dose equivalent of 25 millirems (mREM) to the whole body, 75 mREM to the thyroid, and 25 mREM to any other organ of any member of the public is not exceeded as the result of exposures of radioactive materials, radon and its progeny excepted, to the general public.

6.1.2 Remedial Objectives

The objective is to protect the public from excessive exposure to ionizing radiation released from the Uravan Facility.

6.1.3 Site Status and RAP Requirements

6.1.3.1 Status December 1993 (Excerpted from EPA 1993 Five Year Review, Umetco 1997 Five Year Review, CDPHE 1999 Uravan Remedial Action Plan Status Report)

All data were far below the Atomic Energy Act standard of 25 millirem per year whole body dose. The dose to the nearest residence was calculated to be 0.004 millirem per year.

6.1.3.2 Status October 1999 (Excerpted from Umetco 1997 Five Year Review, CDPHE 1999 Uravan Remedial Action Plan Status Report)

Review of data from the 1994 through 1998 Annual Reports indicate that the nearest residential site received an annual ionizing radiation dose less than the annual Total Effective Dose Equivalent (TEDE) of 100 mREM, as regulated by the Colorado Rules and Regulations (CCR), Standards for Protection Against Radiation, 6 CCR 10007-1, Part 4. The annual Total Effective Dose Equivalent to the nearest resident was 2.55 mREM in 1994, 23.8 mREM in 1995, 96.1 mREM in 1996, and 61 mREM in 1998, The data indicates a trend of increased dose to nearest resident during the period of 1994 through 1998. Umetco considered that the primary contributors of the total dose was radon-222 and its progeny. However,

Umetco considers these values to be conservative estimates of the actual dose of the nearest imparted by the Uravan Superfund Site, as the nearest resident lives more than 6 miles south of the site.

Table 6.1.3-1 summarizes the major requirements for remedial activities associated with Off-Site Dose Limits specified in Section 6.1 of the RAP and status as of October 14, 1999.

6.1.4 Summary of Site Visit Observations and Findings

The site visits of October 13 and 14, 1999 observed the Tabeguache (background), TP-2, Club Mesa, and Atkinson Creek air monitoring stations. The background station was located approximately one to two miles east of the site. Other than the radon track etch monitors, this monitoring station was located behind a fence and visually appeared to be well set-up and maintained. The remainder of the stations were also behind fences.

Recommendations:

1. Umetco should undertake air modeling of the site, including the background and nearest neighbor monitoring stations, to more scientifically determine the potential exposure of the nearest resident to sources of ionizing radiation released from the Uravan Superfund Site.

Table 6.1.3-1 Off-Site Dose Limits		
RAP Requirements	**Required Date of Completion**	**Site Status 10/14/99** ***Ongoing as of 10/14/99***
1. The following work activities shall be conducted for the Off-Site Dose Limit monitoring: **S** An annual report shall be prepared that evaluates doses to off-site individuals and populations and indicates whether the statutory doses are exceeded. The evaluation shall also include details of natural background radiation and of past and present uranium fuel cycle of other operations that have contributed or could contribute to radiation doses above those from natural background radiation values. The evaluation shall also include an up-to-date inventory of sources other than authorized by the site's radiation license issued by the State that could reasonably be expected to affect compliance with the prescribed dose limits.	Annually	***Completed each year as required***.

Table 6.1.3-1 Off-Site Dose Limits		
RAP Requirements	**Required Date of Completion**	**Site Status 10/14/99** ***Ongoing as of 10/14/99***
A topographic map shall be included in the report that shows the locations of the sources within five (5) miles of the site's controlled boundary.		
S UCC/Umetco shall ensure that no garden produce is grown for human consumption on the Uravan Facility.	At all times	***Completed and ongoing***
S UCC/Umetco shall cause all present residences of the Town of Uravan to vacate their residences by December 31, 1986. No building or improvements shall be constructed for or occupied as a residence.		***Completed***

6.2 Health, Safety, and Environmental Procedures

6.2.1 Requirements

UCC/Umetco shall maintain and conduct remedial activities in accordance with comprehensive written health, safety, and environmental procedures manuals, approved by the State. The procedures manuals shall contain safety, monitoring, decontamination, and emergency procedures.

6.2.2 Remedial Objectives

The objective is to protect site workers from excessive exposure to ionizing radiation released from the Uravan Facility and from other site occupational safety and health hazards.

6.2.3 Site Status and RAP Requirements

6.2.3.1 Status December 1993 (Excerpted from EPA 1993 Five Year Review, Umetco 1997 Five Year Review, CDPHE 1999 Uravan Remedial Action Plan Status Report)

Status of this requirement not addressed specifically in the previous EPA Five Year Review.

6.2.3.2 Status October 1999 (Excerpted from Umetco 1997 Five Year Review, CDPHE 1999 Uravan Remedial Action Plan Status Report)

UCC/Umetco maintains internal health and safety policies and programs addressing radiation safety, industrial hygiene procedures, respiratory protection, hearing protection, etc. These programs and policies are, in general, at least as restrictive as U.S. Department of Labor - Occupational Safety and Health Administration (OSHA), Nuclear Regulatory Commission (NRC), and State regulations. These policies and procedures are routinely audited by QC/QA personnel within Union Carbide Corporation, of which Umetco is a wholly-owned subsidiary. In general, these policies and procedures were written between 1988 and 1998. The respiratory protection program was revised in 1998 to reflect changes in the OSHA respiratory protection standard.

In addition to the health and safety policies and procedures, UCC/Umetco has prepared a Site Safety and Health Plan (SSHP), required by OSHA regulation 29 CFR 1926.65, for this Superfund Site. The current

SSHP was revised in 1998 and addresses the requirements of the OSHA hazardous waste site health and safety regulation.

Table 6.2.3-1 summarizes the major requirements for remedial activities associated with Health, Safety, and Environmental Procedures specified in Section 6.2 of the RAP and status as of October 14, 1999.

6.2.4 Summary of Site Visit Observations and Findings

The site visits of October 13 and 14, 1999 found all procedures readily available. A copy of the Hazard Communication Program, with an up-to-date chemical inventory and applicable Material Safety Data Sheets (MSDSs), was also readily available.

Recommendations:

1. None noted.

Table 6.2.3-1 Health, Safety, and Environmental Procedures		
RAP Requirements	**Required Date of Completion**	**Site Status 10/14/99** ***Completed as required as of 10/14/99***
1. The following work activities shall be completed for the Health, Safety, and Environmental Procedures:		
S Administrative and operating procedures relating to radiological health and safety	Not specified in the RAP	***Completed.***
S Instructions and precautions to keep exposures as Low as Reasonably Achievable (ALARA)	Not specified in the RAP	***Completed.***
S Specific information on analytical equipment, laboratories, and procedures for each aspect of the monitoring program	Not specified in the RAP	***Completed.***

6.3 Area Source Air Emissions Controls

6.3.1 Requirements

UCC/Umetco shall implement dust control procedures as approved by the State, in accordance with the Quality Plan.

6.3.2 Remedial Objectives

The objective is to protect site workers, neighboring properties, and the environment from excessive exposure to airborne dusts contaminated with radionuclides released from the Uravan Facility.

6.3.3 Site Status and RAP Requirements

6.3.3.1 Status December 1993 (Excerpted from EPA 1993 Five Year Review, Umetco 1997 Five-Year Review, CDPHE 1999 Uravan Remedial Action Plan Status Report)

Status of this requirement not specifically addressed in the previous EPA Five-Year review.

6.3.3.2 Status October 1999 (Excerpted from Umetco 1997 Five Year Review, CDPHE 1999 Uravan Remedial Action Plan Status Report)

Control of fugitive dust is governed by Uravan Policy and Procedure E-12 *Fugitive Dust Control Plan*. This plan requires watering of all disturbed areas a minimum of twice per day to maintain a surface moisture of five percent or greater; compaction of deposited tailings to specified Proctor densities, re-seeding of areas left undisturbed for six months or longer unless they naturally re-vegetate before six months; restriction of vehicle traffic on unpaved surfaces to less than 20 miles per hour; decontamination of vehicles before leaving the restricted area; stopping work when wind speeds continuously exceed 40 miles per hour; and control of mud and dirt carryout onto paved roads.

Umetco publishes the volume of water used for fugitive dust control in the Quarterly Progress Reports. For example, approximately 24.9 million and 6.5 million gallons of water were applied on the Uravan site for dust control purposes in 1998 and through the first three quarters of 1999, respectively.

A review of Total Suspended Particulate (TSP) monitoring results and correspondence between Umetco and the Air Pollution Control Division of the CDPHE determined that Umetco was generally in compliance with permit conditions listed in Emission Permit No. 88M0020F. However, several instances of exceedences of the 24-hour 135 microgram per cubic meter ($\mu g/m^3$) TSP action level were identified. In 1998, Umetco attributed the several exceedences to the DOE subcontractor placing Title 1 UMTRA materials into the Upper Burbank Repository. This subcontractor was not subject to a CDPHE TSP emission permit. In other cases, high winds reportedly caused the exceedences.

Table 6.3.3-1 summarizes the major requirements for remedial activities associated with Area Source Air Emissions Controls specified in Section 6.3 of the RAP and status as of October 14, 1999.

6.3.4 Summary of Site Visit Observations and Findings

Visual observations during the site visits of October 13 and 14, 1999 determined the fugitive dust control practices to be effective. Large, continuous dust clouds released from any part of the site were not observed during the two-day audit. Speed limit signs restricting vehicle traffic to less than 20 mph around the site were posted. A water truck was traveling around the site applying water to unpaved roads.

Recommendations:

1. It is recommended that, whenever practicable, additional applications of water or amended water solutions be applied to the site when high winds are predicted and/or experienced at the site.

Table 6.3.3-1 Area Source Air Emissions Control		
RAP Requirements	**Required Date of Completion**	**Site Status 10/14/99** ***Ongoing as required as of 10/14/99***
1. The following work activities shall be completed for Area Source Air Emissions Control:		
S Dust control procedures shall be implemented for Residue Storage Areas as approved by the State, in accordance with the Quality Plan.	Not specified in the RAP	***Completed*** All residue storage areas have been removed as of 10/14/99.
S Dust control procedures shall be implemented for controlled area roads by sprinkling or chemical crusting agents and shall limit vehicle speeds to twenty (20) miles per hour.	Not specified in the RAP	***Ongoing*** Dust control for roads is effected through the application of water dispersed from water trucks. Speed limits are set at twenty (20) miles per hour.
S Dispersion of airborne particulates from the tailings disposal area shall be minimized to the extent possible according to a plan approved by the State.	Not specified in the RAP	***Ongoing*** The necessity for dust control on Tailings Pile #3 is minimal, as the final cover, except for the riprap armor, is complete. Dust control on Tailings Pile #1/2 is effected through compaction of the materials.

6.4 Personnel and Facility Monitoring

6.4.1 Requirements

UCC/Umetco shall monitor personnel and the facility in such a manner as to enable the State to estimate the maximum potential occupational radiation dose commitment and to determine compliance with 6 CCR 1007-1-4, in accordance with a written plan approved by the State. The monitoring results shall be reported to the State and presented in such a tabular and graphical form that trends may be readily identified. Personnel monitoring control badges shall be kept in a background location.

6.4.2 Remedial Objectives

The objective is to protect site workers from excessive exposure to radionuclides to which they are exposed while working at the Uravan Facility.

6.4.3 Site Status and RAP Requirements

6.4.3.1 Status December 1993 (Excerpted from EPA 1993 Five Year Review, Umetco 1997 Five Year Review, CDPHE 1999 Uravan Remedial Action Plan Status Report)

Status of this requirement not addressed in the previous review.

6.4.3.2 Status October 1999 (Excerpted from Umetco 1997 Five Year Review, CDPHE 1999 Uravan Remedial Action Plan Status Report)

Occupational monitoring of Umetco and subcontractor personnel is performed to estimate internal and external dose from ionizing radiation resulting from work on the Uravan site. Dose determination methodologies are contained in Uravan Policy and Procedure R-1, *Personal Dose Determination*, approved by CDPHE.

External exposures to ionizing radiation are determined through the use of thermoluminescent dosimeters (TLDs). Every individual working on the site has a personal TLD that is capable of measuring deep dose equivalent, eye lens dose equivalent, and shallow dose equivalent. TLDs are changed quarterly.

Internal doses to gross alpha ionizing radiation are determined from breathing zone samples of personnel working at the site. Breathing zone samples are collected weekly from at least two individuals from each exposure group. For jobs requiring a Radiation Work Permit, breathing zone samples are collected daily until the job is completed.

Urine samples are collected from each person and analyzed for natural uranium and radium-226 according to the following schedule: 1) when first hired, 2) quarterly, 3) termination, and 4) special circumstances.

Exposure monitoring results reviewed from the 1994 through 1998 Annual Reports indicated that all personnel working on site during these years received less than 20 percent of the Total Effective Dose Equivalent (TEDE) of 5 rem or 1 rem. Most results were far below this value.

Table 6.4.3-1 summarizes the major requirements for remedial activities associated with Personnel and Facility Monitoring specified in Section 6.4 of the RAP and status as of October 14, 1999.

6.4.4 Summary of Site Visit Observations and Findings

The site laboratory was visited during the site visits of October 13 and 14, 1999. Visual observations of the laboratory found it to be well organized and clean. Air monitoring records were in good order and records could be found quickly.

***Recommendations*:**

1. None noted.

Table 6.4.3-1 Personnel and Facility Monitoring		
RAP Requirements	**Required Date of Completion**	**Site Status 10/14/99** ***Ongoing as required as of 10/14/99***
1. The following work activities shall be completed for Personnel and Facility Monitoring:		
S UCC/Umetco shall comply with the program as in the procedures manual approved by the Colorado Department of Health and NRC Regulatory Guide 8.22.	Not specified in the RAP	***Completed.***
S Urinalysis for uranium shall be performed for employees assigned to Radiation Work Permit activities exceeding one work day. Specimens shall be collected as close as is reasonably possible to the period beginning 48 hours and ending 96 hours after the latest exposure. The measurement sensitivity shall be 5 microgram per liter (Fg/L) or less. UCC/Umetco shall make a formal documented evaluation if bioassay measurements exceed specified criteria.	Not specified in the RAP	***Ongoing.***

Table 6.4.3-1 Personnel and Facility Monitoring		
RAP Requirements	**Required Date of Completion**	**Site Status 10/14/99**
S Dispersion of airborne particulates from the tailings disposal area shall be minimized to the extent possible according to a plan approved by the State.	Not specified in the RAP	***Ongoing.***
S UCC/Umetco shall conduct an air sampling program to assess radioactivity concentrations to which employees may be exposed as follows:	Not specified in the RAP	***Ongoing.***
• A representative air sample for no less than 30 minutes shall be collected at least quarterly at specified work stations approved by the State to determine airborne uranium concentrations.	Not specified in the RAP	***Ongoing.***
• Breathing zone sampling shall be completed at least quarterly to determine the representativeness of the station air samples.	Not specified in the RAP	***Ongoing.***
• Monthly air samples for no less than 30 minutes duration, representative of potential employee exposure shall be collected at activity and storage locations to determine airborne uranium concentrations.		***Ongoing.***

Table 6.4.3-1 Personnel and Facility Monitoring		
RAP Requirements	**Required Date of Completion**	**Site Status 10/14/99**
• Sampling at selected work areas shall be performed at least monthly to determine radon daughter concentrations. If these values exceed 25 percent of the applicable standards, the frequency of sampling shall be increased to weekly.	Not specified in the RAP	***Ongoing.***
• If the air sampling program reveals work activity locations where concentrations exceed 25 percent of the applicable standards, UCC/Umetco shall establish a procedure to determine time-weighted exposures of employees working at these locations.	Not specified in the RAP	***Ongoing.***

Table 6.4.3-1 Personnel and Facility Monitoring		
RAP Requirements	**Required Date of Completion**	**Site Status 10/14/99**
• In-plant air monitoring committed to in the Colorado Radioactive Materials License, Conditions 11.2 or 11.3, shall be performed under conditions typical of employee exposure.	Not specified in the RAP	***Ongoing.***
• Along with results of airborne activity, UCC/Umetco shall keep a record of the activity during sampling.	Not specified in the RAP	***Ongoing.***
• UCC/Umetco shall maintain records of any respirator maintenance, fit and training programs.	Not specified in the RAP	***Ongoing.***

6.5 Facility Alpha Contamination Sampling

6.5.1 Requirements

UCC/Umetco shall perform documented spot surveys for alpha contamination at least quarterly on ten (10) percent of the workers leaving the facility. Alpha contamination on skin or clothes exceeding 1000 disintegrations per minute per 100 square centimeters (dpm/100 cm^2) shall require decontamination and an investigation by the Radiation Safety Officer (RSO) as to the cause.

6.5.2 Remedial Objectives

The objective is to protect site workers from excessive exposure to alpha contamination to which they may be exposed while working at the Uravan Facility.

6.5.3 Site Status and RAP Requirements

6.5.3.1 Status December 1993 (Excerpted from EPA 1993 Five Year Review, Umetco 1997 Five Year Review, CDPHE 1999 Uravan Remedial Action Plan Status Report)

Status of this requirement not addressed in the previous review.

6.5.3.2 Status October 1999 (Excerpted from Umetco 1997 Five Year Review, CDPHE 1999 Uravan Remedial Action Plan Status Report)

A review of RSO monthly reports for 1998 found that alpha surveys are conducted in eating areas of the break trailer, in the office, and of at least 10 percent of personnel leaving the job site for a specified day of each month. None of the reports indicated results above the specified action level of 1000 dpm/100 cm^2.

Table 6.5.3-1 summarizes the major requirements for remedial activities associated with Off-Site Dose Limits specified in Section 6.4 of the RAP and status as of October 14, 1999.

6.5.4 Summary of Site Visit Observations and Findings

The site visits of October 13 and 14, 1999 did not identify anything of note.

Recommendations:

1. None noted.

Table 6.5.3-1 Facility Alpha Contamination Sampling		
RAP Requirements	**Required Date of Completion**	**Site Status 10/14/99** ***Ongoing as required as of 10/14/99***
1. The following work activities shall be completed for Personnel and Facility Monitoring: **S** UCC/Umetco shall conduct alpha contamination surveys of the lunch rooms, control rooms, change rooms, and offices at least monthly.	Not specified in the RAP	***Completed and ongoing as required as of 10/14/99.***
S If the surveys reveal contamination levels that exceed CDPHE guidelines, the area shall be decontaminated immediately, an investigation shall be made by the Site Manager to determine the cause and corrective measures required to prevent a recurrence, and the location shall be surveyed weekly until four consecutive weekly surveys are below guidelines at which time the survey frequency shall revert to monthly.	Not specified in the RAP	***Ongoing as required as of 10/14/99.*** There were no exceedences of CDPHE guidelines requiring decontamination of acilities or investigations.

6.6 Environmental Monitoring and Analysis Program

6.6.1 Requirements

UCC/Umetco shall conduct an environmental monitoring and analysis program in such a manner as to enable the State to estimate maximum potential radiation dose commitment to individuals and populations off-site and to determine compliance with RAP Section 6.1 (Off-Site Dose Limits), in accordance with a written plan approved by the State.

6.6.2 Remedial Objectives

The objective is to protect off-site individuals and populations from excessive exposure to radionuclides released from the Uravan Facility.

6.6.3 Site Status and RAP Requirements

6.6.3.1 Status December 1993 (Excerpted from EPA 1993 Five Year Review, Umetco 1997 Five Year Review, CDPHE 1999 Uravan Remedial Action Plan Status Report)

Status of this requirement not addressed in the previous review.

6.6.3.2 Status October 1999 (Excerpted from Umetco 1997 Five Year Review, CDPHE 1999 Uravan Remedial Action Plan Status Report)

Ambient Air Monitoring

Environmental monitoring is conducted at six sites in and around the Uravan facility, Figure 6.6.3-1. Monitoring of external radiation is conducted using TLDs. Monitoring to determine public internal exposures to ionizing radiation is conducted by monitoring for radon concentrations using track etch detectors, and for airborne particulates using high volume air monitors with appropriate filters. Track etch detectors were exchanged on a quarterly basis. High volume air sampling filters are analyzed for long-lived radionuclides including natural uranium, radium-226, and thorium-230. It is important to note that the RAP also requires air samples to be analyzed for lead-210. Up to July 1998, filters were composited for analysis on a monthly basis. In September 1998, the Colorado Radioactive Materials License was

amended to permit quarterly composites of air filters. Beginning in July 1998, air sample filters were composited on a quarterly basis.

The types of air ambient air monitoring conducted at each of the six sites are as follows:

- Tabeguache (background): TLD, radon, long-lived radionuclides
- West #2 Pile: TLD, radon, long-lived radionuclides
- Nearest Resident: TLD, radon, long-lived radionuclides
- Atkinson Creek: TLD, radon, long-lived radionuclides
- Club Mesa: TLD, radon, long-lived radionuclides
- Clarifier: TLD, radon, long-lived radionuclides

Radon was also monitored at the following locations: Point Judith, Gas Meter, West of Club Ranch Ponds #7 and #8, and the B-Block.

Results of the monitoring are included in Section 7.0 of this document.

Ground Water

Ground water samples were collected as required between 1994 and the third quarter of 1999 of monitoring wells completed in Club Mesa Salt Wash Member of the Morrison Formation, the Club Mesa - Kayenta/Wingate Sequence, and the River Valley - Kayenta/Wingate Sequence.

Ground water monitoring results for the Club Mesa Salt Wash Member of the Morrison Formation, the Club Mesa - Kayenta/Wingate Sequence, and the River Valley - Kayenta/Wingate Sequence are included in Sections 5.4.1.3, 5.4.2.3, and 5.4.3.3 of this document, respectively.

Surface Water

Surface water samples were collected as required between 1994 and the third quarter of 1999 of surface water related to the Hillside Collection System, the Tailings Pile Toe Drain Systems, Runoff Collection System, the Club Ranch Ponds, and the San Miguel River (including aquatic bioassay monitoring).

Surface water monitoring results for the Hillside Collection System, the Tailings Pile Toe Drain Systems, Runoff Collection System, the Club Ranch Ponds, and the San Miguel River are included in Sections 5.1.1.3, 5.1.2.3, 5.3.3, and 7.8 of this document, respectively.

River Sediments

River sediments were sampled annually between 1994 and 1997 at five stations along the San Miguel and Dolores Rivers. In 1998, the CDPHE amended Colorado Hazardous Materials License 660-02 and removed the requirement for sediment sampling of the San Miguel River. No sediment samples were collected in 1998. Samples were analyzed for natural uranium, thorium-230, radium-226, and lead-210.

Results of the monitoring are included in Section 7.3.1 of this document.

Surface Soils

Surface soils were collected annually between 1994 and 1998 at the six air monitoring stations, Figure 6.6.3-1, except 1994 in which the clarifier location was not sampled. Analytical parameters for the soil samples appeared to vary from year-to-year. For example, in 1994 and 1995, samples were analyzed for natural uranium, radium-226, and thorium-230. In 1996, soil samples were analyzed for natural uranium, radium-226, thorium-230, and lead-210. In 1998, soil samples were analyzed only for radium-226.

In 1998, the CDPHE amended Colorado Hazardous Materials License 660-02 and removed the requirement for soil sampling.

Results of the monitoring are included in Section 7.3.2 of this document.

Procedure Review

All radiological health and environmental procedures were reviewed by Umetco before March 22, 1998. Revisions to certain procedures were expected to be submitted to the CDPHE for approval in 1999.

A review of environmental procedure implementation by site personnel was conducted by Umteco in 1998. Several deviations were identified and action plans developed and implemented.

Table 6.6.3-1 summarizes the major requirements for remedial activities associated with the Environmental Monitoring and Analysis Program specified in Section 6.4 of the RAP and status as of October 14, 1999.

Areas of Non-Conformance

Areas of non-conformance with either the RAP or Colorado Radiological Materials License Conditions included:

- Not changing out high-volume air sample filters on a weekly basis
- Missed quarterly ground water sampling events

6.6.4 Summary of Site Visit Observations and Findings

Air monitoring stations at TSP-2, Tabeguache, Atkinson Creek, and Club Mesa were observed during the site visits of October 13 and 14, 1999. The stations appeared to be well setup. The types of monitoring devices required for each site were confirmed to be in place. Each air monitoring station was located inside a locked wire mesh fence.

6.6.5 Photographs

Photos 6.6.5-1 through 6.6.5-5 show four of the air monitoring stations as of October 14, 1999. Photo 6.6.5-1 shows the TSP-2 air monitoring station at the north end of the site, in the approximate vicinity of the Town Dump. Note the uranium mines visible in the background of the photograph. Photos 6.6.5-2 and 6.6.5-3 show the Tabeguache background air monitoring station, including the radon track etch detectors. Photo 6.6.5-4 shows the Club Mesa air monitoring station, while Photo 6.6.5-5 shows the Club Mesa station.

Recommendations:

1. None noted.

Table 6.6.3-1
Environmental Monitoring and Analysis Program

RAP Requirements	Required Date of Completion	Site Status 10/14/99 *Ongoing as required as of 10/14/99*
1. The following work activities shall be completed for the Environmental Monitoring and Analysis Program:		
S Air particulates shall be:		
• Monitored at the locations specified for Plant Operations at Uravan, at least one nearest feasible residence, and at a control location	Not specified in the RAP	***Completed and ongoing as of 10/14/99***.
• Collected with weekly filter changes or more frequently as required by dust loading	Not specified in the RAP	***Completed and ongoing as of 10/14/99***.
• Composited monthly by location	Not specified in the RAP	***Completed and ongoing as of 10/14/99***.
• Analyzed for natural uranium, thorium-230, radium-226, and lead-210.	Not specified in the RAP	***Completed and ongoing as of 10/14/99***.
S Ambient radon shall be monitored at the locations specified in the Procedures Manual for Plant Operations at Uravan continuously or at least once per month, representing approximately the same period each month.	Not specified in the RAP	***Completed and ongoing as of 10/14/99***.
S Ground water, surface water, river sediments, surface soils, and beta/gamma contamination surveys shall be monitored in accordance with the other provisions of Chapters 4.0 and 5.0 of the RAP.	Not specified in the RAP	***Completed and ongoing as of 10/14/99***.

7.0 COLORADO RADIOACTIVE MATERIALS LICENSE REQUIREMENTS

7.1 Meteorology

Weather observations at the Uravan site have been performed by Umetco Minerals Corporation personnel since 1972. The site maintains a weather monitoring station that records daily minimum and maximum temperatures and precipitation. These data are supplemented by data from the National Climatic Data Center. Monitoring of wind speed and direction ceased in 1987 with approval of the CDPHE.

7.1.1 Precipitation

The average annual precipitation for the period of 1961 through 1998 was 12.33 inches. Annual precipitation between 1994 and 1998 ranged from 9.08 inches in 1994 to 14.47 inches in 1995.

7.1.2 Temperature

The temperature range for the period of 1961 through 1996 was -23° to 110°F. The mean annual temperature between 1994 and 1998 ranged from 54° to 55°F. The low temperature ranged from -4° to 5°F, while the high temperature ranged from 105° to 107°F during the period of 1994 through 1998.

7.2 Stack Emission Quality

The mill was inoperative throughout the period of 1994 through 1999 and no emissions were generated.

7.3 River Sediment, Soils, Vegetation, and Grazing Uptake Monitoring

7.3.1 River Sediment

River sediment monitoring results from 1994 through 1997 indicated that concentrations of natural uranium, thorium-230, radium-226, and lead-210 at all five monitoring stations were generally equal, ranging from 1 to 4 pCi/L. No discernible trends were noted.

In 1998, the CDPHE amended Colorado Hazardous Materials License 660-02 and removed the requirement for sediment sampling of the San Miguel River. No sediment samples were collected in 1998.

7.3.2 Soils

Between 1994 and 1998, soil samples were collected at the six air monitoring stations, e.g., Tabeguache (background), Clarifier, Club Mesa, West Tailings Pile #1-2, Atkinson Creek, and the nearest resident, Figure 6.6.3-1. However, in 1994 the clarifier sample was not collected. The reason for the lack of sample collection in 1994 was not explained in the Annual Report.

Monitoring results from 1994 through 1998 indicated that concentrations of natural uranium, thorium-230, radium-226, and lead-210 at the reclaimed areas in both surface (0-5 cm depth) and subsurface (5-10 cm depth) were generally approaching background values.

In 1998, the CDPHE amended Colorado Hazardous Materials License 660-02 and removed the requirement for soil sampling. Soil samples were collected and analyzed in 1998 before the license was amended.

7.3.3 Vegetation

Forage samples were collected between 1994 and 1998 at the Tabeguache, Atkinson Creek, Club Mesa, and Clarifier air monitoring locations, except in 1994 when the Clarifier location was not sampled. These samples were analyzed for natural uranium, radium-226 and lead-210. General trends indicated relatively constant radionuclide concentrations at all of the sampling locations and are comparable to values at the Tabeguache background location. Some variation is noticeable, but may be attributable to differential uptake by certain plant species and to sampling errors for the vegetation data.

In 1998, the CDPHE amended Colorado Hazardous Materials License 660-02 and removed the requirement for vegetation sampling. Vegetation samples were collected and analyzed in 1998 before the license was amended.

7.3.4 Grazing Uptake

Between 1994 and 1997, meat samples were collected from local ranchers who stated that the animals had grazed in and around the Uravan area. Samples collected in 1994 had no detectable concentrations of radionuclides and no significant changes from the sample results of the last sampling effort of 1990. The error for the samples collected in 1995 and 1996 were very large, indicating the laboratory had matrix problems.

In 1998, the CDPHE amended Colorado Hazardous Materials License 660-02 and removed the requirement for grazing uptake sampling. No meat samples were collected in 1998.

7.4 Tailings Piles #1-2, 3, and the Burbank Repository

Tailings Piles #1-2 and 3 were monitored between 1994 and 1998 for lateral movement, settlement, phreatic levels, and drainage.

7.4.1 Tailings Pile #1-2: Lateral Movement

At the end of 1998, the maximum cumulative movement to-date, as determined by measurement of surface movement monuments, was 1.97 feet at Monument MP-16. The maximum cumulative horizontal movement measured to date is 0.67 feet in a northeasterly direction at Monument MP-11.
Figure 7.4.1-1 shows the movement monuments for Tailings Piles #1-2 and #3.

7.4.2 Tailings Pile #3: Lateral Movement

At the end of 1998, the maximum cumulative movement to-date, as determined by measurement of surface movement monuments, was 0.84 feet at Monument MM-92-5. The maximum cumulative horizontal movement measured to date is 0.40 feet in a northeasterly direction at Monument MP-5A. The general directional trends of horizontal measurements of Tailings Pile #3 indicate that slightly more settlement is occurring near the sandstone abutments where the tailings slimes were deposited.
Figure 7.4.1-1 shows the movement monuments for Tailings Piles #1-2 and #3.

7.4.3 Burbank Repository: Lateral Movement

At the end of 1998, the maximum lateral movement to-date is less than 0.2 foot and the directions of lateral movement from original positions are generally random.

7.4.4 Tailings Pile #1-2: Settlement

At the end of 1998, Tailings Pile #1-2 had settled 9.15 feet in the northen section and 6.44 feet in the southern section since 1987. Umetco reports that the settlement rate of this tailing pile is predominantly influenced by surcharge loading from the ongoing placement of materials. Figure 7.4.4-1 shows the locations of the settlement monuments for Tailings Piles #1-2 and #3.

7.4.5 Tailings Pile #3: Settlement

Between 1987 and the end of 1998, Tailings Pile #3 had settled a maximum of 3.45 feet and 4.36 feet, as measured on the south and north parts of the pile, respectively. Settlement of Tailings Pile #3 is reported by Umetco to be due to secondary settlement. Figure 7.4.4-1 shows the locations of the settlement monuments for Tailings Piles #1-2 and #3.

7.4.6 Burbank Repository: Settlement

By the end of 1998, the settlement rate of the Burbank Repository has decreased to approximately 0.06 foot per year, with a maximum settlement to-date of 0.79 foot.

7.4.7 Tailings Pile #1-2: Phreatic Level

Six piezometers measuring phreatic level are located in the top of Tailings Pile #1-2, and 14 piezometers are located on the side of Pile #1-2. Three of the piezometers located on the side of the pile became blocked between 1994 and 1998. The phreatic levels in all piezometers fluctuated between 1994 and 1998. The phreatic level of the piezometers located in the top of the tailings pile increased an average of 1.7 feet while the phreatic level of the piezometers located on the side of the tailings pile decreased an average of 0.5 feet during this time period. The phreatic levels in the seventeen operational piezometers decreased an average of 0.3 feet showing that the tailings pile was dewatering very slowly between 1994 and 1998. Figure 7.4.7-1 shows the piezometer locations for Tailings Piles #1-2 and #3.

7.4.8 Tailings Pile #3: Phreatic Level

A detailed geotechnical investigation of Tailings Pile #3 concluded that the tailings were saturated in the lower 20 to 30 feet of the pile at the end of 1998.

7.4.9 Burbank Repository: Phreatic Level

No liquid was measured in the standpipe in the collection sump at the toe of the Burbank Repository at the end of 1998.

7.4.10 Tailings Pile #1-2 and 3: Drainage

Drainage rates for Tailings Piles 1-2 and 3 are discussed in Sections 5.1.1.3 and 5.1.2.3 of this document.

7.5 Rim Erosion Monuments

No noticeable erosion or cliff retreat was reported at the locations of the rim monuments. The 1994 through 1998 Annual Reports varied from six to eleven monuments that were included in the survey. The 1998 Annual Report reported that five monuments were removed from service to facilitate reclamation. However, the date(s) that these monuments were removed from service was not indicated in any of the Annual Reports. The monuments remaining in service at the end of 1998 include EM-1, EM-3, EM-4, EM-7, EM-8, and EM-9.

Umetco requested in 1998 that monitoring of the rim erosion monuments be discontinued and instituted as part of the long-term surveillance program. This request was approved by CDPHE. Rim monitoring will be discontinued in 1999 but will be addressed in the long-term surveillance of the site.

7.6 National Pollutant Discharge Elimination System (NPDES) and Storm Water Management Plan Permits

NPDES permits were terminated in 1988. No discharges occurred during the period of 1994 through October 1999 that required a NPDES permit.

A Storm Water Management Plan for the Upper Club Mesa Borrow Area was implemented in November 1993. An annual report was submitted to the Water Quality Control Division of the CDPHE as required for each year.

7.7 Surface Water Monitoring

7.7.1 Club Ranch Ponds Water Balance

Reported in Section 7.14 of this report.

7.7.2 Runoff Collection Monitoring

Runoff Collection Ponds RC-1, RC-2, RC-3, and RC-4 were monitored during the period of 1994 through 1998. Analytical results from water samples collected from these ponds did not identify any significant changes in chemical composition. Metals, radionuclide, and TDS were within the range of previous results. There were some minor variations noted for TDS and sulfates during this period.

7.7.3 Hillside Seepage Collection Monitoring

Hillside Seepage Collection Monitoring and the Toe Drain Collection System are discussed in detail in Section 5.1.1 and 5.1.2 of this report, respectively.

7.8 San Miguel River Water Monitoring

Water samples were collected quarterly from six collection stations on the San Miguel River. Stations 1 and 2 are upstream of the Hillside Seepage Collection System. Station 3 is located in the central, downgradient area of the Hillside Seepage Collection System. Stations 4 and 5 are downgradient of the collection system. Station 6 is downgradient of the Uravan facility.

None of the Annual Reports actually present a statistical basis for Umetco's contention that there are no long-term discernable trends in the surface water quality attributable to the Uravan facility.

Recommendation:

1. A statistical analysis of surface water quality trends should be conducted and included in the next Annual Report.

7.9 Aquatic Bioassay Monitoring

Semi-annual algae and macroinvertebrate samples were collected from the San Miguel River. Samples were analyzed for radionuclides and metals. The data are highly variable and no noticeable trends were identified by Umetco. Increased uranium and radium concentrations were found in both algae and macroinvertebrates was detected in the first half of 1995. Umetco attributed these results to analytical or sampling errors. It is noted that a similar finding for the April 1992 sampling event was reported in the EPA 1993 Five-Year Review.

None of the Annual Reports present a statistical basis for Umetco's contention of no adverse effects of the Uravan site on aquatic organisms.

Recommendation:

1. A statistical analysis of the bioassay monitoring should be conducted and included in the next Annual Report.

7.10 Ground Water Monitoring

7.10.1 Club Mesa - Salt Wash Monitoring Wells

Monitoring results for the Club Mesa Salt Wash monitoring wells is discussed in Section 5.4.1.3 of this document.

7.10.2 Club Mesa - Kayenta/Wingate Sequence Monitoring Wells

Monitoring results for the Club Mesa - Kayenta/Wingate Sequence monitoring wells is discussed in Section 5.4.2.3 of this document.

7.10.3 San Miguel River Valley - Kayenta/Wingate Sequence Monitoring Wells

Monitoring results for the San Miguel River Valley - Kayenta/Wingate Sequence monitoring wells is discussed in Section 5.4.3.3 of this document.

7.11 ALARA and Off-Site Radiation Dose Monitoring

7.11.1 Umetco Site Personnel

Exposure of Umetco and Umetco site subcontractor personnel is discussed in detail in Section 6.4 of this report.

7.11.2 Off-Site Radiation Doses

Off-site radiation doses are discussed in detail in Sections 6.1 and 6.3 of this report.

7.12 Land Use Survey

Recreational activities in the area include fishing, camping, hunting, and rafting. Land in the area is also used for spring, fall, and winter grazing for cattle. Cattle in this area belong to Wiemer Ranches of Nucla, Colorado. No milk or dairy cattle are grazed in the area. Active mining in the area remains on standby. However, there was evidence of mine maintenance activities by Cotter Corporation and mine reclamation by Umetco's Mine Reclamation Group. A small rock quarry is operating five miles southeast of the Uravan facility, near the nearest resident location. In the 1996 Annual Report, Umetco reported that a gold placer mining operation was started approximately 3.2 miles downstream of the Uravan operation. This operation employed two to three persons in 1995. This operation was not noted in the 1998 Annual Report. There are no irrigated farm lands or domestic water wells located within 5 miles of the Uravan facility.

7.13 Sediment Catchment Monitoring

Sediment catchment basins were monitored for accumulation of sediment. Traps were cleaned and maintained on an as-needed basis. Sediment removed from the traps was placed on Tailings Pile #1-2.

7.14 Water Balance Report

The Club Ranch Evaporation Ponds water balances for 1994 through 1998 showed fluctuations due to variations in the quantity of hillside and toe drain seepage, surface runoff, direct precipitation, and extracted ground water collected in the ponds and the quantity of water evaporated from the ponds. Ground water pumped into the Ponds ranged from 3.45 million gallons to 33.8 million gallons during this period. Collected runoff and seepage ranged from 4.9 million gallons to 6.6 million gallons. Direct precipitation collected by the Ponds ranged from 13.6 million gallons to 17.7 million gallons during the period of 1994 through 1998. The average annual evaporation rates for the ponds was more constant during this period, ranging from approximately 2.4 to 2.8 gallons per minute per acre.

At no time during this period were there overflows or other discharges of liquids from the lined to the unlined Club Ranch Evaporation Ponds. The only discharge of liquids from the lined Club Ranch Evaporation Ponds was through evaporation.

At the end of calendar year 1998, the Club Ranch Evaporation Ponds storage capacity ranged from 43 to 80 percent full, and the remaining freeboard in the Ponds ranged from 5.9 to 9.7 feet.

7.15 Analytical Laboratory Quality Control

A minimum of ten percent duplicates are submitted to the contract laboratory to verify testing procedures. Also, the Uravan site laboratory runs ten percent duplicates, spikes, blanks, or blinds in-house for an independent check on consistency. In 1994 and 1995, Umetco considered analytical accuracy and precision to be generally good.

The 1998 Annual Report provided more quantitative data associated with its evaluation of laboratory quality control. In 1998, approximately 205 sets of water samples were collected at the Uravan site. Eighteen sets of duplicate samples were collected and analyzed for the same set of parameters as the primary set. Relative percent difference (RPD) was calculated for results that yielded units of mass, while relative error ratio (RER) was calculated for results that yielded units of radioactivity. The acceptance criterion for RPD was less than or equal to 20 percent. The acceptance criterion for RER was less than or equal to 1.0. The eighteen duplicated sample sets yielded 731 analyte pairs. Seventeen of the 731 pairs, or approximately 2.3 percent, exceeded the respective acceptance criterion.

8.0 COMMUNITY RELATIONS

After the EPA 1993 Five Year Review was released in 1994, the EPA received a letter from a Mr. Ken Slight of Moab, Utah. In this letter, Mr. Slight raised a few concerns related to the potential health effects resulting to individuals using the San Miguel River for recreational purposes, e.g., river outfitters. In early 1995, Dr. Robert Benson, a toxicologist with the Region VIII Drinking Water Branch, issued a letter to Mr. Gene Taylor, EPA Remedial Project Manager for the Uravan Superfund Site. In this letter, Dr. Benson concluded there was minimal hazard to recreational users of the San Miguel River posed by radionuclides in either the water or river sediments. No other concern letters was received by either the State or the EPA.

9.0 NATIONAL HISTORIC PRESERVATION ACT

9.1 Summary of Section 106 Requirements

The National Historic Preservation Act (NHPA) was enacted because of public concern that so many of our nation's historic resources were not receiving adequate attention as the government sponsored much needed public works projects. In the 1960s, federal preservation law applied only to a handful of nationally significant properties, and Congress recognized that new legislation was needed to protect the many other historic properties that were being harmed by federal activities.

Section 106 of NHPA requires that every federal agency "take into account" how each of its undertakings could affect historic properties. An agency must also afford the Advisory Council a reasonable opportunity to comment on the agency's project. Pursuant to the October 1992 Amendments to the National Historic Preservation Act, an "undertaking" means a project, activity, or program funded in whole or in part under the direct or indirect jurisdiction of a federal agency, including (A) those carried out by or on behalf of the agency; (B) those carried out with federal financial assistance; (C) those requiring a federal permit, license, or approval; and (D) those subject to state or local regulation administered pursuant to a delegation or approval by a federal agency.

For purposes of Section 106, any property listed in or eligible for the National Register of Historic Places is considered historic. The National Register is this country's basic inventory of historic resources and is maintained by the Secretary of the Interior. The list includes buildings, structures, objects, sites, districts, and archaeological resources. The listed properties are not just of nationwide importance; most are significant primarily at the state or local level. The protections of Section 106 extend to properties that possess significance but have not yet been listed or formally determined eligible for listing.

The federal agency involved in the proposed project or activity is responsible for initiating and completing the Section 106 review process. Under certain circumstances, local governmental bodies may act as the responsible agency. The agency works with the State Historic Preservation Officer (an official appointed in each state or territory to administer the national historic preservation program) and the Advisory Council to do so. There can be other participants in the Section 106 process as well. At times, local governments, representatives of Indian tribes, applicants for federal
grants, licenses, or permits, and others may join in the review process when it affects their interests or activities.

The Section 106 process includes the following steps:

1. Determine whether an undertaking that could affect historic properties will be initiated. "Historic properties" are those that are included in the National Register of Historic Places or that meet the criteria for the National Register. If so, it must identify the appropriate State Historic Preservation Officer Preservation Officer (SHPO) to consult with during the process. It should also plan to involve the public, and identify other potential consulting parties. If it determines that it has no undertaking, or that its undertaking has no potential to affect historic properties, the agency has no further Section 106 obligations.

2. If the agency's undertaking could affect historic properties, the agency determines the scope of appropriate identification efforts and then proceeds to identify historic properties in the area of potential effects. The agency reviews background information, consults with the SHPO and others, seeks information from knowledgeable parties, and conducts additional studies as necessary. Districts, sites, buildings, structures, and objects listed in the National Register are considered; unlisted properties are evaluated against the National Park Service's published criteria, in consultation with the SHPO. If questions arise about the eligibility of a given property, the agency may seek a formal determination of eligibility from the National Park Service. Section 106 review gives equal consideration to properties that have already been included in the National Register as well as those that meet National Register criteria. If the agency finds that no historic properties are present or affected, it provides documentation to the SHPO/THPO and, barring any objection in 30 days, proceeds with its undertaking. If the agency finds that historic properties are present, it proceeds to assess possible adverse effects.

3. The agency, in consultation with the SHPO, makes an assessment of adverse effects on the identified historic properties based on criteria found in the Council's regulations. If they agree that there will be no adverse effect, the agency proceeds with the undertaking and any agreed-upon conditions. If the parties cannot agree or they find that there is an adverse effect, the agency begins consultation to identify ways to avoid, minimize, or mitigate adverse effects.

4. In order to resolve adverse effects , the agency consults with the SHPO and others, who may include Indian tribes and Native Hawaiian organizations, local governments, permit or license applicants, and members of the public. The Council may participate in consultation when there are substantial impacts to important historic properties, when a case presents important questions of policy or interpretation,

when there is a potential for procedural problems, or when there are issues of concern to Indian tribes or Native Hawaiian organizations. Consultation usually results in a Memorandum of Agreement (MOA), which outlines agreed-upon measures that the agency will take to avoid, minimize, or mitigate the adverse effects. In some cases, the consulting parties may agree that no such measures are possible, but that the adverse effects must be accepted in the public interest.

5. If an MOA is executed, the agency proceeds with its undertaking under the terms of the MOA.

6. If consultation proves unproductive, the agency or the SHPO, or the Council itself, may terminate consultation. If a SHPO terminates consultation, the agency and the Council may conclude an MOA without SHPO involvement. However, if a THPO terminates consultation and the undertaking is on or affecting historic properties on tribal lands, the Council must provide its comments. The agency must submit appropriate documentation to the Council and request the Council's written comments. The agency head must take into account the Council's written comments in deciding how to proceed.

7. Public involvement is a key ingredient in successful Section 106 consultation, and the views of the public should be solicited and considered throughout the process. The regulations also place major emphasis on consultation with Indian tribes, in keeping with the 1992 amendments to NHPA. Consultation with an Indian tribe must respect tribal sovereignty and the government-to-government relationship between the Federal Government and Indian tribes. Even if an Indian tribe has not been certified by NPS to have a Tribal Historic Preservation Officer (THPO) who can act for the SHPO on its lands, it must be consulted about undertakings on or affecting its lands on the same basis and in addition to the SHPO.

9.2 Status of Uravan and the Uravan Superfund Site With the National Historic Preservation Act

The Uravan Historic District, including the Joe Junior Mill and Camp and Uravan were listed on the Colorado State Register of Historic Places in June 1994. Any undertaking by a State agency must be assessed to determine its effects on such properties as outlined in Section 80.1 of the State Register Act. In July 1995, the Uravan Historic District was determined to be eligible for the National Register of Historic Places under Criteria A, as it represented the history of radium, vanadium, and uranium mining in Colorado, and made a significant contribution to the Manhatten Project during World War II.

9.3 History of Discussions/Actions Concerning the National Historic Preservation Act at the Uravan Superfund Site

Neither the Consent Decree or the RAP required Umetco to comply with Section 106 of the National Historic Preservation Act while implementing remedial actions at the Uravan Superfund Site. In addition, neither the State or the EPA initiated the Section 106 process, as described in Section 9.1.

The State Historical Society first became aware of remedial activities at Uravan in June 1995 during a site visit to review work being conducted at Uravan that was funded through the State Historic Fund.

The Colorado Historical Society informed CDPHE in a letter of July 3, 1995 that maintenance of three buildings at the Uravan Site, e.g., the Boarding House, Recreation Hall, and Uravan Drug Store, would be adequate to convey this significance of the importance of historic heritage. CDPHE responded in a letter of August 1, 1995 that compliance with requirements of Section 106 of the Historic Preservation Act of 1966 during the remedial action at the Uravan Superfund Site were not specifically included in the Final Consent Decree or RAP when they were issued in 1986. Instead, the RAP only provided for alternatives to demolition if site equipment or facilities pass the free release criteria for radioactive contaminated materials.

As documented in a September 5, 1995 letter from CDPHE to Umetco, during a June 28, 1995 meeting between representatives of the CDPHE, State Historical Society, and Umetco, it was agreed that Umetco would not demolish either the Boarding House or Community Building and that Umetco would attempt to decontaminate the buildings and install a radon mitigation system in each building. Agreements concerning the status of the Uravan Store was not documented in this letter.

The Drug Store was demolished in mid- to late-September 1995. In a letter of December 1, 1995 from CDPHE to the State Historical Society, the agreements made during the June 1996 meeting was amended to state that the Drug Store would be demolished as the foundation contained excessively high concentrations of radioactive contamination in its foundation. The letter of September 5, 1995 neglected to require preservation of the Drug Store until it could be photographed by representatives of the Colorado Historical Society. The Colorado Historical Society was not notified of the impending demolition of the Drug Store until after demolition was completed.

In a letter of May 22, 1996, the CDPHE informed the EPA of the following alternative remediation measures concerning the preservation of the Community Center and Boarding House at Uravan agreed to by the CDPHE, Umetco, the Colorado Historical Society, the Museum of Western Colorado, the Rimrock Historical Society, and the Town of Naturita:

- Umetco will preserve and spare from demolition the Boarding House, Community Center, and several vehicles
- Umetco would remove the most significant contamination in the structures and in the underlying and immediately surrounding soils while not endangering the stability of the buildings
- Umetco would then install a radon mitigation system in each building
- Umetco would restore the buildings to the extent that they will be in stable structural condition before the buildings and surrounding area are transferred to the custody of the Rimrock Historical Society

These alternatives were agreed to in order to both preserve the buildings as an historical resource and to protect the health of the citizens of Colorado and other visitors.

In 1997, Umetco submitted the results of three engineering studies regarding remediation of the Uravan historical buildings, including the radon mitigation system plans for the Boarding House and the Community Center. These reports were approved by the Colorado Historical Society and tentatively approved, with provisions, by the EPA. In mid-1997, Umetco began developing radon mitigation plans for the historical buildings. Umetco also began developing excavation plans to remove contaminated material in direct contact with the foundations of the two buildings.

In early 1998, the State approved the radon mitigation plans and tentatively approved the excavation plans. Excavation of contaminated materials around the buildings and placement of backfill near the buildings was completed by mid-1998. In a meeting of June 15, 1998, Umetco reversed their position on preserving the Boarding House and Community Center and instead recommended that these buildings be demolished. The reported reasoning behind this change in Umetco's position was that they were concerned about their long-term legal liability with leaving the buildings intact, knowing that they could not be completely decontaminated. It was agreed during this meeting that Umetco would complete a Preliminary Risk Assessment for the buildings by September 1998 using data obtained from a survey based on the Sampling and Analytical Plan approved by the State. Revisions to the risk Preliminary Risk Assessment would be made, as necessary, by January 1999 when the buildings characterization was completed.

Plans to remove and replace the roof was initiated by Umetco in the third quarter of 1998 and were completed the first quarter of 1999. Estimates were prepared in the second quarter 1999 to replace and/or refurbish the exterior siding, broken windows, and general exterior maintenance . Estimates and plans were also being formulated to remove and replace the porch structures on both buildings, as they were in very poor condition. The estimates and plans were under internal review in the third quarter 1999 and would then be provided to the Rimrock Historical Society and Colorado Historical Society for review, comment, and concurrence prior to soliciting bids for the work.

On July 28, 1999, the Colorado Historical Society requested additional information from Umetco regarding a map of the site indicating specific details of disturbed areas, road construction, current ownership of certain parts of the site, etc. This information has not yet been provided to the Colorado Historical Society.

9.4 Evaluation of Site's Compliance With Section 106 Requirements

Based upon a review of the Section 106 documentation discussed above and also of records regarding site contaminant concentrations and remedial activities, it is concluded that:

1. Initial Uravan site remedial activities were not conducted in compliance with Section 106 requirements, specifically consultation with the Colorado Historical Society, the Rimrock Historical Society, or the National Advisory Council on Historic Preservation prior to and during initiation of site activities.

2. Prior to completion of remedial activities, most of the Uravan Superfund Site and associated buildings and underlying soils contained unacceptable concentrations of radionuclide contamination that precluded their decontamination to levels protective of human health, and therefore, preservation as historical buildings.

3. Prior to completion of remedial activities, many of the buildings and underlying soils within the Town of Uravan contained unacceptable concentrations of radionuclide contamination that precluded their decontamination to levels protective of human health, and therefore, preservation as historical buildings.

4. Other than the Uravan Drug Store, Umetco has preserved the buildings identified by the Colorado Historical Society and the Rimrock Historic Society as historical buildings in the Uravan Historic District.

5. The Risk Assessment completed by Umetco documented that it is possible, with certain restrictions, to remediate radionuclide contamination of the Boarding House and Community Center to levels that are protective of human health.

6. Complete implementation by Umetco on commitments regarding preservation of the two remaining historical structures is essential to ensure future compliance with Section 106 requirements. This includes the preparation of an overall site history documentation with photographs that will be submitted to the Rimrock Historical Society.

7. Complete understanding of constraints on unrestricted use of the Boarding House and Community Center is essential to ensure preservation of the health of employees and volunteers working under the auspices of the Colorado Historical Society and Rimrock Historical Society.

Recommendations:

1. Communication and consultation with the Colorado Historical Society, Rimrock Historical Society, and other interested parties should be fully undertaken regarding further work at the site that is subject to Section 106 requirements.

2. Umetco should preserve the two remaining historical structures, as presently committed.

3. Volunteers working under the auspices of the Colorado Historical Society and Rimrock Historical Society should be fully advised of the findings of the risk assessments of the Boarding House and Community Center.

4. Umetco should immediately provide the information requested in the July 28, 1999 letter from the Colorado Historical Society to Umetco. The Society should also be advised of the status of the funding provided to Umetco by the Colorado Historic Grant.

9.5 Observations of Site Visit, October 13 and 14, 1999

The two historical buildings were observed during the site visit of October 13 and 14, 1999. The site visit did not include going into the buildings. Excavation and back filling around both buildings was evident. Although the areas have not been revegetated by Umetco, small amount of vegetation has been re-

established naturally around the perimeter of the buildings. Both buildings had new roofs, but in general, both buildings visually appeared to be in need of exterior maintenance, e.g., new painting and/or siding, etc. In particular, the porches of the Boarding House were in very poor condition, with large holes and rotted wood visible from the road.

9.6 Photographs

Photos 9.4-1 through 9.4-4 show the historical buildings as of October 1999. Photo 9.4-1 shows both buildings, with the Boarding House on the left and the Community Center on the right. Excavation around both buildings is evident, as are the new roofs. Photo 9.4-2 is a close-up view of the Boarding House. The poor condition of the upper balcony is evident looking at the bottom side of the balcony. Photo 9.4-3 is a close-up view of the Community Center. Photo 9.4-4 shows the location of the historical buildings compared to the remediated A-Plant Area.

10.0 SUMMARY OF SITE VISIT

MK representative, Craig Beck, and EPA representatives, Gene Taylor and Paul Osborne, traveled to the site on Tuesday, October 12, 1999. MK and EPA representatives arrived at the Umetco site office at 8:30 a.m. on Wednesday morning, October 13, and met the following personnel:

- John Hamrick: Umetco Manager of Environmental Affairs
- Gene Greenwood: Umetco Site Superintendent
- Mike Schierman: Umetco Radiation Safety Officer
- Rahe Junge: Umetco Site Hydrogeologist
- Don Simpson: Colorado Department of Public Health and Environment, On-Scene Coordinator.

Prior to the meeting, Mr. Schierman conducted a site safety briefing for the MK and EPA representatives, as required by the Site Health and Safety Plan. Upon completion of this briefing, MK and EPA began the meeting by discussing the Five Year Review process and what topics would be reviewed during the visit. Mr. Greenwood then explained the current status of the Uravan Superfund Site and what activities had been initiated and/or completed since the last EPA Five Year Review was conducted in late-1993. After Mr. Greenwood had completed his presentation, the group boarded a van to begin a tour of the site.

The tour traveled along County Road EE-22 on its way to the Club Mesa areas. The first area of the site visited was the Burbank Quarry Repository. As discussed in Section 4.8, the Burbank Quarry Repository has been totally completed and has received its final cover. A diversion ditch is located along the west and east sides of the repository. Another diversion ditch separates the lower and upper repositories. The ditch also delineates the boundary line between the lower repository owned by Umetco and the upper repository owned by the DOE. While at the Burbank Quarry Repository, the group could also see parts of the Club Mesa Borrow Area. No operations appeared to be ongoing at the time of the visit.

The Club Mesa Spray Disposal Area could also be viewed from the top of the Burbank Quarry Repository Area. As discussed in Section 4.5 of this report, remediation of this area is complete and no other actions were ongoing during the visit.

The tour then traveled to the south side of Tailings Pile #3 and the new B-Plant Repository via a site access road. This road was barricaded by a locked gate to restrict access by the general public. Warning signs were also observed on the gate and fences. The group was able to view standpipes of the Toe Drain Collection System of Tailings Pile #3 and the new toe drain system being installed along the toe of the new B-Plant Repository. The new B-Plant Repository Return Water Pond was in the final stages of completion, and Umetco was in the process of abandoning the old Return Water Pond and some of the Tailings Pile #3 toe drain lines that would eventually be covered by the B-Plant Repository. The south side of the B-Plant Area was also observed during this part of the tour. Excavation to bedrock was visually confirmed.

The group then traveled back down County Road EE-22 to the Town Dumps Area. Parts of the Hillside Collection System was viewed. Small quantities of hillside drainage was being collected in the shotcrete-lined ditches that drained to the Lower Pond located along County Road EE-22. All aspects of this part of the collection system appeared to comply with the RAP, with the exception of the ditch liner, as discussed in Section 5.1.1 of this report.

On the way to the Town Dumps, the group stopped off by the River Ponds Area. As discussed in Section 4.2 of this report, remediation of the River Ponds Area is complete. Visually, the site appeared to be in compliance with the RAP. The remediated A-Plant Area could also be viewed from this vantage point. No remaining buildings were observed. The group also stopped by the Town of Uravan. No remaining buildings were observed. Vegetation had been re-established in this area, and the area visually appeared to be in compliance with the RAP.

As discussed in Section 4.7 of this report, the Town Dumps had been excavated in 1998. Excavation of this area to underlying bedrock was visually confirmed during the visit. Remedial activities at this area appeared to be in compliance with the RAP. The group then traveled to the Atkinson Creek Disposal Area. As discussed in Section 4.1 of this report, remediation of this area is complete, and vegetation has re-established itself. This area also visually appeared to be in compliance with the RAP.

The group then traveled back towards the Tailings Pile areas. The group stopped off next to the Club Ranch Evaporation Ponds. All liners visually appeared to be in good condition. The new enhanced evaporation system was viewed. All ponds contained liquids and variable amounts of raffinate crystals were observed on the liners.

Prior to entering the Exclusion Zone, a pencil dosimeter was given to Gene Taylor of the EPA to wear during this part of the tour. While traveleing on the B-Plant Access Road, few remains of the Hillside Structures could be viewed, primarily adits leading to underground structures located inside Club Mesa. The group then traveled to Tailings Pile #1-2 to view the ground water seep discovered during the October 1999 CDPHE routine compliance inspection. Details of the seep are discussed in Section 4.4 of this report. The top of Tailings Pile #1-2 had been compacted, but was not covered with any part of its final cover. The drainage diversion ditch was constructed along the north side of the Pile.

The group then traveled to Tailings Pile #3 to view the joint separation. The group also viewed the new piezometers and surface settlement and movement monuments. Tailings Pile #3 had been covered with all of its final cover materials except for the riprap, as discussed in Section 4.4 of this report.

While traveling back towards the Site Office Building, the group was able to view the old B-Plant Area on the south side of Tailings Pile #1-2. None of the B-Plant buildings were observed, and excavation to bedrock in this area could be confirmed. The existing and new Return Water Ponds could be viewed from this vantage point, also. The group then stopped to view the remediated A-Plant area. None of the A-Plant buildings or facilities remained. Excavation had continued to bedrock resulting in excavation of more than eight feet of material in most places.

The tour continued on to the Site Office Building. Prior to leaving the Exclusion Zone, the tour van was decontaminated with a high-pressure spray wash. Each individual included in the tour was frisked for removable contamination with a hand-held meter. The pencil dosimeter carried by Gene Taylor was also read at this point and found to have 0 millirem exposure during the tour.

Upon returning to the office, additional discussions on the site status were conducted. The site visit concluded at approximately 4:00 p.m, upon which the MK and EPA representatives returned to Naturita.

Craig Beck and Paul Osborne returned to the site at approximately 8:00 a.m. on Thursday morning and met with Mike Schierman and Gene Greenwood. Mr. Greenwood accompanied the MK and EPA representatives on another site tour. The first area visited was the Lower Pond located along County Road EE-22. Mr. Greenwood explained how the pond collected both hillside seepage and runoff water and the means of transferring the water eventually to the Club Ranch Evaporation Ponds. We then traveled to the Club Mesa Air Monitoring Station where the air monitors were viewed. The station visually appeared to be in compliance with the RAP. The excessive TSP concentrations observed in 1998 from the DOE upper Burbank Quarry Repository operations were discussed while at this station.

The tour then went into the Exclusion Zone to visit the Tailings Piles, Hillside Drainage Collection Systems, and Toe Drain Systems. Prior to entering the Exclusion Zone, the pencil dosimeter was given to Paul Osborne. The Middle Pond of the Hillside Drainage Collection System was observed. The pond was located along the B-Plant Access Road. It collected liquids from a shotcrete-lined ditch. A small quantity of sediment was observed in the bottom of the pond. Visually, the system appeared to be operated in accordance with the RAP. Toe Drain Sump #2 was then observed. This was a double chambered concrete structure located at the northeast corner of Tailings Pile #1-2. Mr. Greenwood explained that this sump was capable of handling the volume of water collected by the Toe Drain System. The pump had recently been overhauled. This system visually appeared to be operated in compliance with the RAP. While traveling in the area of the Tailings Piles, the runoff collection system and various ponds were observed. All aspects visually appeared to be operated in compliance with the RAP.

Upon completion of the Tailings Pile Area visit, the group left the Exclusion Zone. The van was decontaminated in a similar manner as the previous day. Personnel were screened for removable contamination with a pancake probe. The pencil dosimeter read 0 millirems.

The group then traveled to some of the other Air Monitoring Stations. All stations visually appeared to be operated in compliance with the RAP. Following this part of the tour, the group returned to the Site Office Building. Mr. Mike Schierman showed the auditors the air monitoring laboratory, personal air monitoring equipment, and calibration equipment. All aspects of the laboratory visually appeared to be in good order. The auditors also conducted a brief review of site records. All records requested were provided in a timely

manner. The records were found to be well organized. As explained by Mr. Schierman, some records are maintained at Umetco's Grand Junction office and are not kept at the site.

After the file audit, the MK and EPA representatives left the site and traveled north along County Road Y-11 to the general area of the Club Ranch Evaporation Ponds. An area by Pond #1 had visual signs of raffinate crystals along the San Miguel River. Mr. Osborne of the EPA indicated that this was the same area that he observed raffinate crystals in 1989. The auditors then returned to Naturita. The auditors returned to Denver on Friday, October 15, 1999.

11.0 SUMMARY AND RECOMMENDATIONS

Remedial activities at the Umetco Minerals Corporation Uravan Remedial Action Project are being conducted in general compliance with the RAP. Exceptions noted in this report include:

- Incomplete or missed ground water sampling events in 1994, 1995, 1996 and 1998
- Improper implementation of air sampling procedures
- Non-submittal of Final Completion Reports

Based on available information, it appears that selected remedies remain effective in protecting the health of the public and environment.

As noted in the report, the following recommendations are made regarding future implementation of RAP requirements:

1. Final Completion Reports should be submitted to the State for the Atkinson Creek Area, the Mill Areas, Town and Adjacent Areas, Burbank Quarry, completed Toe Berm Seepage System, Club Ranch Ponds, Club Ranch Pond Area ground water monitoring and extraction wells completed prior to 1999, should be submitted to the State as soon as possible.

2. Additional studies should be taken along the banks of the San Miguel River by Club Ranch Evaporation Pond #1 to determine the presence of raffinate crystals.

3. The joint separation in Tailings Pile #3 should be remediated as soon as possible, and no later than December 31, 2000.

4. Tailings Pile #3 should be investigated for ground water seeps similar to that experienced in Tailing Pile #1-2.

5. The ground water seep identified in Tailings Pile #1-2 should be quickly and thoroughly investigated to determine potential sources and possible mitigation measures, including construction of additional diversion structures on Club Mesa.

6. The future remediation strategy for the Hillside Structures should be agreed to by Umetco and the State as soon as possible to ensure that additional cleanup is undertaken in a manner protective of both the environment and the workers

7. Documentation of the field approval permitting the use of shotcrete rather than HDPE to line the Hillside Collection System drainage ditches should be provided as soon as possible.

8. The 1998 Annual Report should be revised to reflect changes in Club Mesa Salt Wash Member of the Morrison Formation ground water monitoring requirements, e.g., status of wells V-771, V-762 and V-764S, and radionuclide concentration reporting values.

9. The 1998 Annual Report should be revised to reflect changes in Club Mesa Kayenta-Wingate Sequence ground water monitoring requirements, e.g., status of wells CRP-16, CRP93-1, CRP93-2, and CRP-93-3, and radionuclide concentration reporting values.

10. Ground water extraction activities should continue in Club Ranch Pond Area wells completed in high and low permeability zones until all statistical evaluations required in the RAP are completed.

11. Umetco should undertake air modeling of the site to more scientifically determine the potential exposure of the nearest resident to contaminants potentially released from the site.

12. Where practicable, additional applications of water should be applied to minimize the quantities of dust released from the site when high winds are predicted and/or experienced.

13. Statistical analyses of San Miguel River water and aquatic bioassay monitoring results to determine if there are any discernable trends in surface water quality attributable to the Uravan site.

14. Statistical analyses of San Miguel River aquatic bioassay monitoring results to determine if there are any discernable effects on San Miguel River aquatic organisms attributable to the Uravan site.

15. Umetco, state, and federal agencies should consult closely and completely with the Colorado Historical Society, Rimrock Historical Society, and other interested parties to ensure compliance with Section 106 requirements.

16. Umetco should immediately provide requested information to the Colorado Historical Society and completely implement preservation activities of the two remaining historical structures, as presently committed.

17. Umetco should continue to implement internal QA/QC procedures to ensure collection of all ground water samples, as scheduled, and that all ground water samples are analyzed for the full suite of analytes.

18. Ground water monitoring results less than the method detection limits for the specific analyte(s) should be recorded as such, not as “0".

19. The investigation results of the Atkinson Creek stream bed should be provided to the State as soon as possible.

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APPENDIX 1

FIGURES

APPENDIX 2

PHOTOGRAPHS

APPENDIX 3

SUMMARY OF GROUND WATER MONITORING RESULTS
CLUB MESA SALT WASH MEMBER OF THE MORRISON FORMATION
MONITORING WELLS 1994-1998

APPENDIX 4

SUMMARY OF GROUND WATER MONITORING RESULTS
CLUB MESA KAYENTA-WINGATE MONITORING WELLS
1994-1998

APPENDIX 5

SUMMARY OF GROUND WATER MONITORING RESULTS
SAN MIGUEL RIVER VALLEY KAYENTA-WINGATE SEQUENCE
MONITORING WELLS
1994-1998